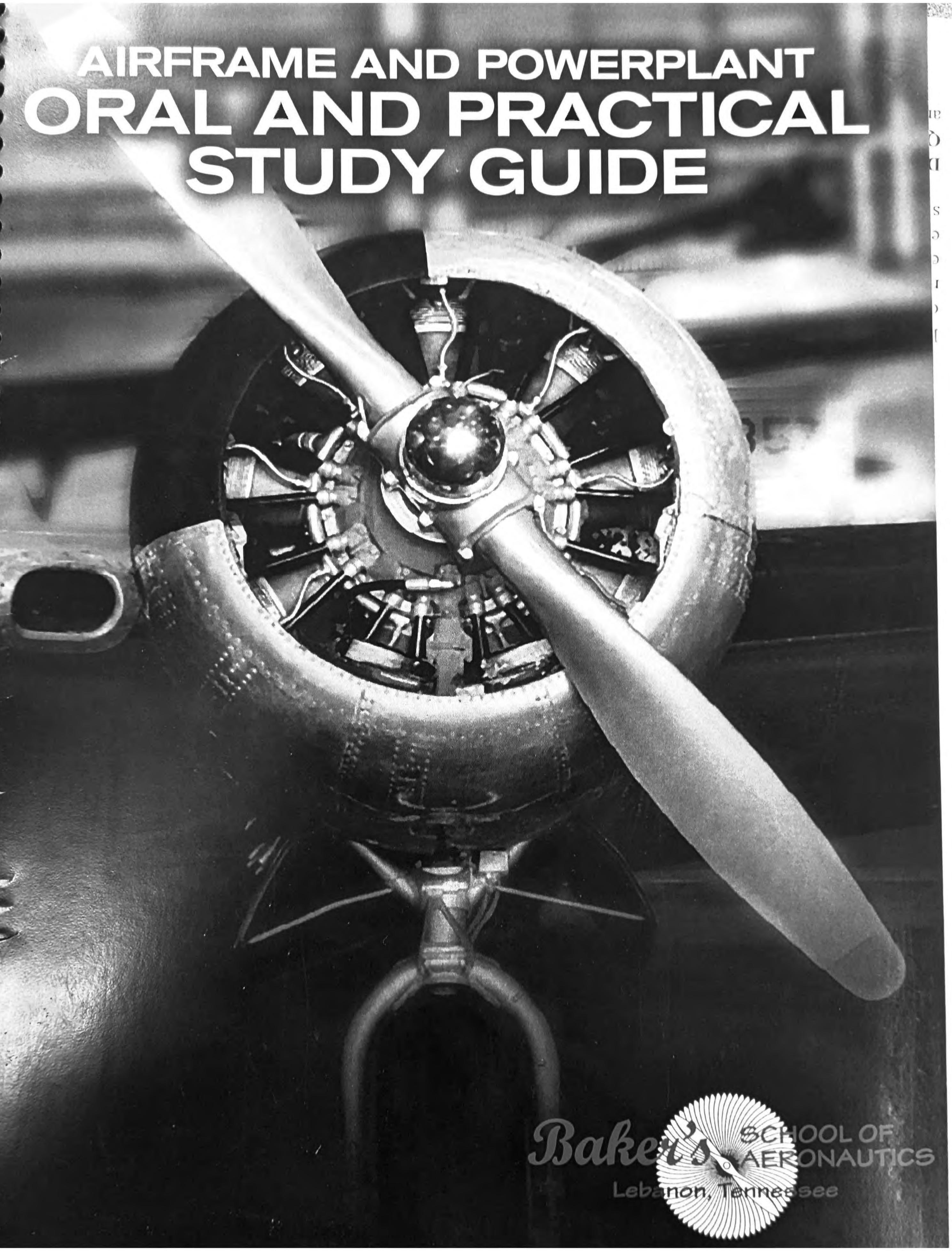
AIRFRAME AND POWERPLANT
ORAL AND PRACTICAL STUDY GUIDE



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Lebanon, Tennessee

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Instructions for Baker's O&P Study Guide

Dear Student,

Thank you for choosing Baker's School of Aeronautics for your Oral and Practical preparation. Your O&P exam has already been scheduled with one of our local DME's (Designated Maintenance Examiner).

We are sending you our O&P Prep Study Guide so that you may get a head start before coming to our school. Please read the following instructions on how to proceed through this book.

ORALS

Airframe and Powerplant: There are 5 sections and 44 subjects (see table of contents)

I. General containing 12 subjects
II. Airframe Structures containing 7 subjects
III. Airframe Systems & Components containing 10 subjects
IV. Powerplant Theory & Maintenance containing 3 subjects
V. Powerplant Systems & Components containing 12 subjects

-If you are coming for both licenses (**A&P**) please study **ALL sections and ALL subjects.**
(General is required for your first license, i.e. A&G or P&G)
-If you are wanting to obtain just the **Airframe (A&G) license** and **DO NOT** already have the **Powerplant** license you will need to **study sections I, II, and III, all subjects.**
-For the **Powerplant (P&G) study sections I, IV, and V, and all subjects.**
-If you already have the **Airframe** and are intending to **"add-on"** the **Powerplant**, **study only sections IV & V.** -For the **Airframe "add-on" study only sections II and III.**

Please read through all subjects of study for your particular license(s). Then have one of your friends or co-workers (preferably someone with an aviation back ground) ask you all the questions. You do not have to memorize the answers word for word. You need to only have a good understanding. The examiners want the answers in your own words. You will be asked a minimum of 4 questions from each subject. Therefore the minimum total number of questions would be 176 questions (4 x 44 subjects = 176).

DO NOT ***get involved in Appendix 1, 2, or 3 of this book.*** **Spend your time only on the Oral Questions and Answers.** We will give you the instruction needed to complete these sections when you arrive.

Airframe and Powerplant: Oral and Practical Study Guide

April 2022

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Preface

This study guide contains sample oral questions and answers, plus practical exercises to aid the aircraft mechanic applicant in preparing for the Federal Aviation Administration (FAA): General, Airframe and Powerplant – Oral and Practical Exam.

Our school has been writing our own study guides and preparing applicants for their aircraft maintenance careers since 1973. It takes a lot of work to earn a FAA Airframe and Powerplant (A&P) certificate, and we at Bakers are proud to say, that we work hard to assist our customers in successfully completing their A&P written, oral and practical exams. We also provide training to prepare the A&P mechanic for their Inspection Authorization (IA) exam.

Because of the many requests from our customers, we began selling our study material for individuals wishing to prepare for exams at home. We have sold our A&P written material for many years with much success. However, we have always viewed the Oral and Practical (O&P) study material a little differently.

First, the O&P questions and projects are not made public. Second, the O&P exam has never been quite as standard as the other FAA exams.

These exams are computer generated from a question bank by the FAA for each applicant just prior to the exam. Our resident students do very well on their &P exams with our study guide, however, at school the students also benefit from specific instruction and guidance they receive from our hands on instruction, lack of distractions, and the ability to study in groups.

Even though we have set up this study guide to represent the 5 Sections (1 General, 2 Airframe and 2 Powerplant), broken down into 44 subjects that are asked on the O&P exams, we cannot guarantee that these will be the same questions and projects that will be given on your exam. Before attempting an O&P exam in your location, you should talk with the Designated Mechanic Examiner (DME), who will be administering the exam to you. They can probably offer a few hints on what to expect while taking their exams and give you some suggestions on preparation.

For this study guide to be successful at home, individuals will be required to spend a lot of time researching FAA publications. This is an especially important step in being successful in passing your practical exam since you are allowed to use reference material during the practical portion of your exam. (You WILL NOT be allowed to research any material during your oral exam.)

This manual was not designed to take the place of any FAA study material, but rather was intended to be used in conjunction with that material.

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INTRODUCTION

FAA Eligibility Requirements (Step 1)

To qualify for the Airframe (A) and/or Powerplant (P) rating, the Federal Aviation Administration (FAA) (14 Code of Federal Regulations (CFR) Part 65.71 - 65.80) requires that an applicant:

A. Possesses/provides a certificate of completion from an approved aviation maintenance school, certificated under 14 CFR Part 147 **or**

B. Possesses/provides written proof of the required experience. Documented proof of 18 months experience for one rating (A or P), or 30 months experience for both ratings (A&P) as per 14 CFR Part 65.77. This written documentation may be in the form of letters, DD-214 forms and/or training certificates **and**

C. Is required to be at least 18 years of age, be able to read, write, speak, and understand the English language, and pass the required written tests within a 24-month period **and**

D. Is also required to present up to 2 forms of government issued photo identification

It is always recommended to call your local Flight Standard District Office (FSDO), and speak with an Aviation Safety Inspector (ASI) to determine what documentation they will require you to bring to their office to obtain your authorization (FAA Form 8610-2).

Applicant will be required to complete 2 (two) original FAA 8610-2 forms (Airmen Certificate and/or Rating Application). An example of the 8610-2 form is provided in this study guide, on page viii. Ensure that the FAA ASI has completed required information and printed and signed their names on both forms. **Copies of your 8610-2 are not acceptable.** You will need to present these forms to the appropriate testing designee, before being allowed to take any of the required FAA tests for certification.

The FAA Written (Computerized) Tests (Step 2)

Before you can take the Oral and Practical Test with a Designated Mechanic Examiner (DME), you must first take and pass the required written tests. The written tests are given by Computerized Test Designees (CTDs), which you will need to contact to schedule your test. Your local FSDO should be able to provide you with the available CTDs in your area. Testing fees normally range $125.00 - $175.00. You can bring a simple electronic calculator for use on the test, but this is not required. We will provide one in the testing center for you. The CTD will provide you with any FAA approved reference material required for the test.

The computerized testing procedure is quite simple and the CTD personnel will explain the procedures the day you arrive for your test. You will be allowed to take a computerized tutorial test first, to help you familiarize yourself with the testing procedures. The CTD may make a copy of your 8610-2 form for their records, but the original must be returned to you, because you must also present the original 8610-2 forms to your DME when you are ready to take the Oral and Practical (O&P) exam.

Oral and Practical (O&P) Exams (Step 3)

After taking and passing the required FAA computerized tests, the applicant has 24 months to complete the O&P test with a DME. Your local FSDO can provide you with a list of the available DMEs in your area. The applicant must present to the DME:

A. The computerized test reports (General, Airframe, Powerplant) from PSI **and**

B. The certificates from an approved 14 CFR Part 147 aviation maintenance school **or** Military cert.

C. The 2 (two) original FAA Form 8610-2 forms (see page viii) **and**

D. Up to 2 (two) forms of government issued photo identification.

The DME is required to give you both an oral and a practical test.

Testing fees for the O&P exam can range significantly from one DME to the next. Before selecting a DME to administer the O&P test, it is recommended to ask him how much he charges for the initial test, as well as any required retest. Some DMEs will not offer you any discounts on second or third attempts, even though you may have passed most of the exam. The O&P exam covers 5 Sections, broken down into 44 subjects, this Study Guide covers all subjects. Your examiner is required to cover all 44 subject areas for an Airframe and Powerplant test. If an applicant fails any portion of the Oral and Practical exam, the DME will list the failed sections on the back of the applicant's 8610-2 form by section and subject. If you schedule to retake the Oral and Practical test with the same DME within 30 days after failure, you will be required to have another certified mechanic give you additional instruction and sign a letter stating that additional instruction has been given. If retesting is necessary, the DME is only required to retest you on the failed sections as listed on the back of the 8610-2 form. Upon completing and passing your O&P test, the DME will issue you a temporary certificate the same day as testing. The DME will process the appropriate paperwork through the FAA. Once the FAA has processed your exam paperwork, they will mail you your permanent certificate.

FAA TEST PREPARATION

To do well on the Oral and Practical exams, as well as the written tests, a person needs to incorporate their past experience and skills as much as possible. Since the FAA mechanic test covers all facets of aviation maintenance, individuals normally do better if they attend a structured course of instruction. In school, you will have instructors to guide you and answer any questions on areas that may not be familiar to you. The school will also have all the necessary FAA publications available for research and study. When preparing for these exams at home, without an instructor, you should first ensure that you have access to the required FAA publications for research and study. The FAA publications that are used most for preparation on these exams are listed in Appendix 4 of this study guide

The Oral Test

For the oral test, (closed book) the DME will sit down with you ask the required questions which are generated by the FAA question bank. You must successfully answer 3 of the 4, or 5 of the 7 questions correct to pass that subject. Sample oral test questions are presented in this study guide, covering the 44 subject areas. We suggest that as you go through the oral questions in this study guide, you locate information in the appropriate FAA publication if you do not completely understand the answer. This process will be time consuming, however, will prove to be a beneficial learning experience and the knowledge gained will be extremely helpful during your practical test.

The Practical Test

The practical test given by any DME can vary, depending on the equipment the DME has available and the area in which he or she may feel is important during your testing process. The practical projects are also generated by the FAA question bank. It will also be very beneficial to look over and work through the information and projects found in Appendices 1 and 2 of this study guide. As with the oral section, if any of the information or projects is not completely understood, research the subject in the FAA publications to help you. We have provided some instruction and formulas with most of the projects found in these two appendices, however, you may need to refer to the appropriate FAA publication to give you a better understanding on completing these projects. Knowing how to research and use the prescribed FAA publications is an important part of the practical portion of the O&P tests. Most DMEs will have these publications available to you during your practical test.

Other

Other areas that an applicant should be proficient in are listed below:

-Researching Type Certificate Data Sheets and Aircraft Specifications
-Researching Airworthiness Directives and Service Bulletins/Letters
-Interpreting the applicability and requirements of Airworthiness Directives
-Locating information in Aircraft Maintenance Manuals

Section I – General

Oral Questions

Section I – General (12 Subjects)		
Basic Electricity	Subject A	9
Aircraft Drawings	Subject B	12
Weight and Balance	Subject C	14
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Cleaning and Corrosion Control	Subject G	24
Mathematics	Subject H	26
Maintenance Forms and Records	Subject I	28
Basic Physics	Subject J	31
Maintenance Publications	Subject K	33
Aviation Mechanic Privileges and Limitations	Subject L	35
(FAA RESERVED)	Subject M	N/A

Subject A - Basic Electricity

1. What is the most important law applicable to the study of electricity? **Ohm's Law (E= I x R)**

2. What are the elements of Ohm's Law? **Voltage (E), Current (I), and Resistance (R)**

3. What are four sources of electrical energy? **Thermal, light, pressure, and chemical.**

4. What does an electrical circuit consist of? **1. A source (battery). 2. Resistance or load (Light bulb). 3. Conductors (Wires).**

5. What represents capacitance in an AC circuit? **A capacitor (same as a condenser).**

6. What is the function of a capacitor? **To store electricity.**

7. What is the unit of measure for capacitance? **Farad.**

8. What is the standard unit of measure for frequency? **Hertz.**

9. What is the basic component that only allows current to flow in one direction? **A diode (acts like a check-valve)**

10. What is inductance? **When voltage is induced by magnetic flux lines in a coil in an AC circuit. The induced voltage is opposite in direction to the applied voltage and opposes any change in the alternating current.**

11. What is an example of an inductor in a magneto? **The coil.**

12. What is impedance? **The total opposition for AC to flow caused by the combined effect of resistance, inductive reactance, and capacitive reactance in an AC circuit.** ***(Total resistance)***

13. What causes opposition to the flow of current in an AC circuit? **Inductive, and capacitance reactance.**
14. What is the unit of measurement for impedance? **Ohms.**

15. What is the general purpose of a resistor? **To limit current.**

16. How may the value of a small, fixed resistor be determined? **By the color bands on the resistor.**

17. What are two things that happen when current flows through a conductor? **A magnetic field is generated, and the conductor heats up.**
18. What is the common name for the lines of force that make up a field surrounding a magnet? **Magnetic flux lines.**

19. What is the concept that describes the relationship between electricity and magnetism? **Electromagnetism.**

20. What are the four factors that affect the resistance of an electrical conductor? **The wire gauge, length, temperature, and material.**

21. What is the unit of measurement of power in a DC circuit? **The watt. Amperes times volts equals watts (P =I x E). 746 watts equals one horsepower.**

22. What is a kilowatt? **It is 1,000 watts.**

23. In a DC circuit, what occurs when voltage is increased while resistance remains constant? **There will be an increase in current.**

24. What are the three types of DC electrical circuits? **They are Series circuits, Parallel circuits, and Complex circuits (series and parallel).**

25. A 24-volt lead-acid battery has how many cells?
It has 12 cells, and each cell is rated at approx. 2 volts.

26. What are the units that battery capacity is measured in? **Ampere-hours.**

27. What should be the specific gravity of the electrolyte in a fully charged lead acid battery? **It should be between 1.275 and 1.300.**

28. What instrument is used to determine the specific gravity of electrolyte in a lead acid battery? **A hydrometer.**

29. Why can a hydrometer **NOT** be used to determine the charge of a nickel-cadmium battery?
The specific gravity of the electrolyte in a nickel-cadmium battery does not change appreciably during charge or discharge of the battery.

30. When using a hydrometer to check the charge of a lead-acid battery, at what temperatures must a correction factor be applied to the reading.
Adjustments must be made if temperature of the electrolyte is above 90°F or below 70°F.

31. What is electromagnetic induction?
It is the transfer of electrical energy by means of a magnetic field (lines of flux). Transferring voltage from one conductor to another without physically touching. This is the principle of transformer operation.

32. How are battery compartments protected against corrosion?
They are coated with special corrosion resistant paint such as bituminous paint.

33. What should be the correct electrolyte level in a properly serviced battery?
It should be approximately 3/8 inches above the plates. If the battery has baffle plates above the cell plates, the electrolyte level should be up to the hole in the baffle plate in each cell.

34. What are paralleling generators and how is the load distributed?
This is when two or more generators are operated at the same time to supply power for a load that must be shared *equally*.

35. Describe a no-trip circuit breaker (trip free).
A "Trip Free" breaker makes it impossible to manually hold the circuit closed when excessive current is flowing. (It pops when circuit gets hot and can't be reset until it has cooled off.)

36. Can you store Ni-cad and Lead-acid batteries together?
No, the fumes from the Lead-acid battery can contaminate the electrolyte in the Ni-cad battery.

37. What is the result of an imbalanced cell in a nickel-cadmium battery?
When a cell has a low internal resistance, the current will increase across the cell, causing it to heat up.

38. What happens to the specific gravity of the electrolyte in a lead acid battery when the temperature changes? **The specific gravity readings on a hydrometer will vary with temperature variations. For example, as the temperature of the electrolyte increases, the specific gravity reading will be high, and colder electrolytes will have a lower apparent reading.**

39. What is a L.E.D.? **Light Emitting Diode.**

40. What is a S.L.A. battery? **Sealed Lead Acid Battery.**

41. What is the basic unit of measure for inductance? **Henry.**

42. What prevents reverse current flow in a D.C. Alternator? **Reverse current cutout.**

43. How many wires may be installed on a single terminal lug? **Four.**

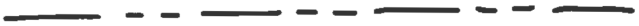
44. How do you identify wire types? **Lettering on the insulation.**

45. Name some functions of a multimeter. **voltage (volts), current (amps) and resistance (ohms).**

Subject B -Aircraft Drawings

1. What type of lines are used on aircraft drawings to indicate hidden views, center lines, and alternate position lines?
A hidden view line is a medium width line made up of short dashes. It represents and edge that cannot be seen when looking at the part from a specific position (see page 13)

Center lines are thin lines composed of alternating long and short dashes, and are used to indicate the center of an object or center of a void.

Alternate position lines are medium width lines composed of one long and two short evenly spaced dashes. They are used to show the alternate position of a part or the relative position of a missing part. 

2. How are dimension lines shown on aircraft drawings?
Dimension lines are solid, and usually broken at midpoint for insertion of measurement indications.

3. What is a sketch for a repair?
It is a basic drawing that shows specific information and provides minimum detail needed to manufacture a part.

4. How may an aircraft drawing of a part be drawn to bring out pertinent details?
By drawing a detailed view at a larger scale than the principal view.

5. What type of drawing is most helpful in troubleshooting a system? **A schematic.**

6. Define "tolerance" as used in aircraft drawings.
The difference between the plus and minus allowable dimension of a part. (± of .005 = .010)

7. Define "clearance" as used in aircraft drawings.
Clearance is the dimension given for the space between parts.

8. What is a fuselage station number?
It is the distance from the datum measured in inches along the longitudinal axis.

9. What information is given in the title block of a blueprint?
The drawing number, the name of the part or assembly, the scale, the date, the name of the firm, the name of the draftsman, the checker, and the approving official.

10.Where is the title block usually found on an aircraft drawing?
In the lower right corner.

11.Why are dimensions used, and how are they shown on the aircraft drawings?
Dimensions are solid narrow lines, broken at midpoint for the insertion of measurements. They are used to indicate the size of an object.

12. How can a change to an aircraft drawing be identified?
By its revision letter (A, B, C, etc.) The revision letters are usually listed in a table next to the title block or in the corner of the drawing.

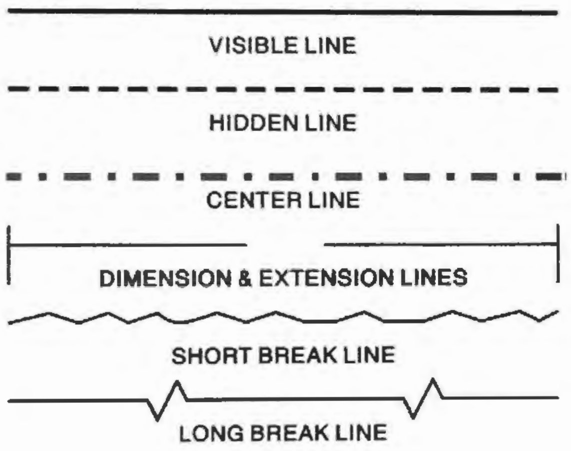
13.What is the "bill of materials" associated with aircraft blueprints?
It is a list of materials and parts necessary for fabrication or assembly of a component or system.

14. Why are symbols used by manufacturers when drawing aircraft blueprints?
Symbols are a type of shorthand used in drawings. They express the characteristics of a component with a minimum amount of drawing or writing.

15. What is an orthographic projection?
A way of illustrating an object in a drawing, by showing different views at right angles to each other, such as front and side views.

16. How many views are required to determine the shape of an object?
Three views: Front, Right and Top *(FRT)*

17. What is the purpose of one view drawings?
They are used for objects of uniform thickness, such as gaskets, shims, and plates.



Subject C - Weight and Balance

1. What is the datum and its purpose when making weight and balance computations?
It is an imaginary vertical line or plane from which all measurements are taken both forward and aft to determine the relative location of items in the aircraft.

2. What items concerning weight and balance could be found in the TCDS?
Datum, ***C***.g. limits, ***U***nusable fuel and oil, ***B***aggage capacity, ***S***eat locations, ***F***uel capacity, ***L***eveling means, ***E***ngine horsepower, ***W***eight (maximum) (***D-CUBS-FLEW)***

3. What is the purpose of weight and balance control?
For safety and efficiency in flight.

4. When computing weight and balance, what is the "moment" and how is it obtained?
Moment is a force which tends to rotate the aircraft about one of its axes. It is obtained by multiplying the weight of an item (pounds) by the distance of the item from the datum (inches). It is expressed in "inch-pounds." (W x A = M)

5. How would a negative moment be obtained forward of the datum?
By adding weight.

6. What is the "arm" of an item and how is it obtained?
The arm is the distance (in inches) an item is located either forward or aft of the datum. It is obtained either by actual measurement or from the aircraft weight and balance records.

7. What is "tare weight", and how is it handled when making weight and balance calculations?
"Tare" is the weight of extra equipment used for weighing the aircraft such as chocks, blocks, jacks, and chains. Tare weight must be subtracted from the scale readings in order to obtain the Empty Weight of the aircraft.

8. What is meant by "minimum fuel" and how is it calculated for weight and balance?
The amount of fuel needed for an extreme condition check, to see if the center of gravity will be out of limits in that situation. For a reciprocating engine airplane, the calculation is: maximum except takeoff horsepower divided by two (METO divided by 2).

9. What is meant by "residual" fuel?
It is the fuel remaining in the tanks, sumps, lines, and engine after fuel exhaustion. Also called "undrainable" or "unusable." It IS part of the aircraft's empty weight.

10. What is meant by the center of gravity range?
It is the distance in inches from the most forward acceptable center of gravity to the most rearward acceptable center of gravity.

11. What is an aircraft loading graph?
A method for determining load distribution so that the aircraft remains within its operating C.G. range.

12. How would you determine the empty weight and empty weight C.G. of an aircraft if all weight and balance records are missing?
Re-weigh the aircraft and calculate new weight and balance records.

13. What is the difference between fixed wing and rotor wing (helicopter) aircraft C.G. ranges?
The C.G. location in a helicopter is much more critical than fixed-wing aircraft (forward, aft, port, and starboard must be calculated). The C.G. range in some helicopters will be less than three inches.

14. When weighting an aircraft to determine the empty weight C.G., what must you do regarding the fixed equipment which is normally carried in the aircraft?
All operations equipment, whether it is required, optional, or special equipment, must be included in the aircraft's empty weight.

15. Why do some manufactures specify an empty C.G. even though the aircraft is not operated at this empty weight? **When the empty weight C.G. falls within the empty weight C.G. range, it is unnecessary to perform a weight and balance check if standard loading and seating arrangements are used.**

16.Why must the aircraft category be considered when computing weight and balance?
Some aircraft are certified in both normal and utility categories. This means a different maximum allowable gross weight depending on which category the aircraft will be operated in for that day. (Two different useful load calculations.)

17.Where is the center of gravity located in relation to the aerodynamic center of lift for most airplanes?
In front of the center of lift.

18.What are two common ways of representing the C.G. of an aircraft?
Inches from the datum, or percent of mean aerodynamic chord (% of MAC).

19. Is there a federal regulation that requires the regular re-weighing of private aircraft?
No.

20.Where must a record of the most recent empty weight and center of gravity be kept?
It should be maintained in the aircraft flight manual or weight and balance records. (In accordance with FAR 23.1583)

21.What should be done regarding aircraft fuel when performing a weight and balance when draining is not an option?
When weighing an aircraft with full fuel tanks, the exact weight per gallon should be verified with a hydrometer. Then, the weight of the usable fuel must be mathematically subtracted in the weight and balance calculations.

22. How should aircraft fuel be drained for weight and balance?
Level the aircraft per the TCDS and then drain the fuel system until empty, which will leave unusable fuel in the system.

23.What is ballast?
Ballast can be lead bars, metal plates, shot bags, sandbags, or other items of weight which are placed in the aircraft to attain a desired C.G. location.

24. If the forward C.G. Limit of an aircraft is exceeded after installing several items in the engine compartment, how could the limit be returned to limits without removing or changing any of the newly installed equipment?
By adding a ballast weight in the rear of the aircraft.

25.What are the placard requirements for ballast?
The ballast location must have a placard stating any limitations on contents, including weight, that are necessary under the loading requirements.

26.What is recommended for marking of permanent ballast?
In red paint, mark with "permanent ballast, do not remove."

27. How should an aircraft be leveled for weighing during a weight and balance?
It should be leveled per the requirements of the Aircraft Specifications, or Type Certificate Data Sheet.

28. Name one common method of leveling an aircraft during weight and balance?
You may use a built-in leveling scale and a plumb bob.

29. Describe a plumb bob and its use.
It is a heavy object in the shape of a cone that is used to determine a spot directly below the point the tool is hanging from.

30. How can you determine if a part will affect the CG without weighing the aircraft?
The effect can be determined by basic computations if the weight and balance records are up to date. If the records are up to date, basic weight and balance computations may be used.

Subject D - Fluid Lines and Fittings

1. What are two types of commonly used fluid lines used in aircraft plumbing?
Metal tubing or flexible hose and fittings.

2. How is metal tubing sized?
By outside diameter and wall thickness. OD is measured fractionally in sixteenths of an inch.

3. What material should be selected for high-pressure rigid fluid lines?
Annealed or 1/4-hard corrosion-resistant steel.

4. What type of material should fittings be made of when used with stainless steel tubing?
Stainless steel.

5. What percentage of flattening is allowed when bending metal tubing?
25% Max (Must maintain 75% of the original tube diameter)

6. What precautions should be taken when routing fluid lines adjacent to electrical wiring?
Route the fluid lines below the electrical wiring and maintain a clearance of at least six inches whenever possible. In no case should fluid lines and electrical wiring be closer than one-half inch. Ensure that both the wiring and the fluid lines are fastened to the aircraft structure by clamps or other methods that will maintain the separation.

7. What is the purpose of the identification stripe running along the length of a flexible hose?
The stripe is called a lay line and indicates if the hose has twisted during installation. There is no allowable twist.

8. What are some synthetic materials commonly used to manufacture flexible hoses?
Buna-N, Butyl, Ethylene propylene diene rubber, Neoprene, and Teflon. *B.B.E.N.T.*

9. How are standard AN type and AC type fluid line fittings identified?
AN fluid line fittings are colored either blue or black while AC type fittings are usually gray or yellow. AN fittings have coarser threads and they have a small shoulder between the threads and the 37 degree flare cone. The AC fittings are completely threaded all the way to the 35-degree flare cone.

10. What is the purpose of using quick disconnect couplings in fluid systems?
They provide a means of quickly disconnecting a line without a loss of fluid or air entering the system. Quick disconnect couplings are installed at locations where frequent uncoupling of the line is required for inspection and maintenance. Each half has a valve that is open when coupled together and spring loaded to close when disconnected.

11. How is flexible hose sized?
By the inside diameter in sixteenths of an inch increments.

12. How much slack must be left in a flexible hose during installation?
Five to eight percent of the total hose length must be allowed for freedom of movement under pressure.

13. How often should flexible hoses be clamped in place?
Every 24 inches.

14. Name considerations when installing flexible hose assemblies.
Slack, flexing, twisting, bending, clearance, and clamps.

15. What pressure is used to proof-test a flexible hose assembly?
Typically, 1.5 times the recommended operating pressure of the hose.

16. What are the three parts of a Military Standard (MS) tube fitting?
The body, the sleeve, and a nut.

17. What will be the result of over tightening a flareless tube fitting?
The compression sleeve's cutting edge will cut too deep into the tube and cause the tube to be weakened. Flareless fittings are made up of the tube, compression sleeve, and nut.

18. What are the two kinds of flares used in aircraft plumbing systems?
A single flare and a double flare.

19. What is the difference between automotive and aviation flares?
Aviation flares should be 37° and automotive are 45°.

20. What is the advantage of flexible Teflon hose over rubber hose?
Teflon hoses have better resistance to chemicals and a higher strength property at higher temperatures.

21. What precaution should be taken when deburring and inspecting the flared end of a tube?
Care should be taken that the tubing is not cracked or that the wall thickness is not reduced by the deburring process.

22. What type of rubber is used in flexible lines that carry phosphate-ester hydraulic fluid?
Synthetic.

23. What type of information is on a hose lay-line?
Information found on the lay line will include the type of hose, and the quarter and year of manufacture.

24. What are the identification marks usually found on flexible rubber hoses?
Lay line, hose size, manufacturer, date of manufacture, pressure, and temperature limits.

Subject E - Materials and Processes

1. What is a suitable nondestructive testing method for detecting surface cracks on aluminum castings and forgings?
The dye penetrant inspection method detects surface cracks with equal success on aluminum, magnesium, brass, copper, and titanium. It can also be used on ceramics, plastics, and glass.

2. List the steps in a dye-penetrant inspection.
1. Thoroughly clean the materials surface.
2. Apply the penetrant for the specified dwell time.
3. Remove the penetrant with water or emulsifying cleaner.
4. Dry the part.
5. Apply the developer.
6. Inspect the results.

3. Describe the procedure for performing a magnetic particle inspection
Thoroughly clean all grease, oil, and dirt from the metal part which must be of ferrous material such as iron or steel. Magnetize the part and then apply the ferromagnetic particles, either held in liquid suspension or in dry powder form, to the area to be inspected. If a discontinuity is present, the magnetized particles will form a pattern in the approximate shape of the discontinuity.

4. What are two types of self-locking nuts?
All metal, and fiber-lock, or elastic stop nuts.

5. What is the general rule for using self-locking nuts?
Do not use self-locking nuts at joints which are subject to rotation.

6. What type of cable is used in primary control systems?
Extra flexible 7 x 19 cable.

7. How can the correct "grip length" of a bolt be determined?
The grip length should equal the total thickness of the materials being joined together. The grip of a bolt is the unthreaded portion of the bolt shank.

8. The length of AN standard bolts are measured in what fraction?
8ths of an inch

9. What does the triangle mean on the head of a steel bolt?
That it is a close tolerance bolt.

10. What numbers are used for close tolerance bolts?
AN-173 through AN-186 for hex-head bolts, and NAS-80 through NAS-86 for countersunk.

11. What is the difference between a standard bolt and a close tolerance bolt?
A close tolerance bolt is machined to more precise dimensions and is used in high performance applications.

12. A solid rivet diameter is always measured in what fraction?
32nds of an inch.

13. Describe a rivnut.
It is a threaded body that is riveted to the aircraft structure.

14. What is the purpose of a channel nut and nutplate?
Both nuts allow a screw or bolt to be installed without needing to hold the nut with a wrench.

15. What are common materials for cotter pins to be made from?
Low carbon steel, and stainless steel.

16. What is the smallest cable that can be used in primary control systems?
One-eighth inch in diameter.

17. What should be the depth of penetration when making a fillet weld?
Penetration should be 25 to 50 percent of the thickness of a base metal.

18. What precision measuring instruments are used to measure outside dimensions?
Outside micrometer and Vernier calipers.

19. What term describes a metal that is based on iron?
Ferrous alloy.

20. What should be the width of the weld bead and depth of penetration when making a butt weld?
The bead width should be 3 to 5 times the thickness of the base metal and there should be 100 percent penetration.

21. What system is used to identify AN type aircraft bolts?
Aircraft bolts have code markings on the bolt heads for identification. Bolt diameter is measured in 16th of an inch and length is measured in 8th of an inch increments.

22. What is the difference between a close-tolerance and regular AN bolt?
Close tolerance bolts are used in applications where the bolted joint is subjected to severe vibrations and load reversals. Also, close tolerance bolts are machined to more precise standards and must be driven in by a hammer.

23. What are the steps for solution heat treating aluminum alloys?
The alloy must be heated to a predetermined temperature, heat soaked for a specified period, and then rapidly quenched to a relatively low temperature.

24. In what state is aluminum alloy immediately after solution heat treating and quenching?
The alloy is in a comparatively soft state, so the material must be naturally aged, or precipitation hardened.

25. What is done to prevent certain aluminum alloy rivets (D and DD) from becoming hard after heat treating and quenching?
The rivets are stored in a refrigerator at a temperature lower than 32°F. The rivets will remain soft for several days. They are also called "Ice box rivets."

26. What do rivet head markings indicate?
The alloy of the rivet.

27. Why is alloy steel that is responsive to heat treatment usually less suitable for welding?
Because of its tendency to become brittle and loose its ductility around the weld.

28. Why should steel be normalized after welding or machining?
To remove internal stress of the metal, thereby reducing brittleness.

29. What are two methods of case hardening?
Carburizing and nitriding.

30. What are the characteristics of a cold weld?
A cold weld has improper penetration and cold laps caused by insufficient heat. It appears rough and irregular and its edges are not feathered into the metal base.

31. What tools are used to measure the outside dimensions of shafts, thickness of sheet metal stock, diameter of drills, and for many other similar applications?
Outside micrometer or caliper.

32. What should be used to make a visual inspection of a weld?
A magnifying glass of at least 10x.

33. Name some types of non-destructive testing used on non-ferrous materials.
Eddy current, dye penetrant, x-ray, coin tap, and visual inspection.

34. What is the most common type of corrosion?
Surface Corrosion.

35. What does a ¼ -20 bolt mean?
Bolt diameter and thread count.

36. Why should a micrometer be periodically calibrated?
To help ensure micrometer accuracy.

37. A solid rivets length is measured in what fractional increments?
16ths of an inch.

38. What are some types of washers used on aircraft? (You probably only need two versions)
Spring lock washer, flat washer, lock tooth washer, tab washer, finishing washer.

39. What is an M.S.D.S.? **Material Safety Data Sheet. (This is an old term, the new version is SDS *safety data sheet*)**

Subject F - Ground Operation and Servicing

1. What is the procedure for extinguishing an induction system fire that occurs during starting of a reciprocating aircraft engine?
Continue cranking the engine to try and suck the fire out. If cranking the engine does not work, then extinguish the fire using CO2.

2. What is the purpose of pulling a propeller through by hand for two or three revolutions prior to starting a radial or inverted engine?
To detect hydraulic lock. Any liquid present in the cylinder will be indicated by abnormal effort required to rotate the propeller, or by the propeller stopping abruptly during rotation.

3. What damage is most likely to occur if excessive force is exerted on the crankshaft when there is liquid lock?
The force can bend or break a connecting rod or permanently damage the cylinder.

4. What information must be located on or near fuel filler openings and oil filler openings?
For fuel filler openings, the word "fuel" and the minimum fuel grade or designation for the engine. Oil filler openings require the word "oil" to be marked at or near the filler cap.

5. Why must aircraft and fuel trucks be grounded together with a grounding cable?
To eliminate the buildup of static electricity that could result in explosion.

6. Describe the system used to designate performance rating of aviation gasoline.
For fuels below grade 100, octane numbers are used. For fuels above grade 100, the numbers represent the performance rating of the fuel compared to 100 percent iso-octane.

7. What would be the result of operating an aircraft reciprocating engine using a lower grade of avgas (aviation gasoline) than that specified for the engine?
There would be a loss of engine power, efficiency, and possible detonation.

8. What color is low lead 100 dyed?
Blue.

9. What are the functions of tetraethyl lead in avgas?
To lubricate and reduce detonation.

10.Why should an aviation mechanic know the meaning of the standard light signals which are used by control tower operations?
If radio communication is not possible, the light signals may be used for taxi control when an aircraft must be taxied to another part of the airport.

11. What type of knot is typically used when securing an aircraft outdoors with a rope?
A bowline knot.

12. Which publication lists the standard FAA hand signals a taxi signalman should use?
The FAA Airman's Information Manual (AIM).

13. What is the result of mixing aviation gasoline with jet fuel in a turbine engine?
When aviation gasoline is mixed with jet fuel, the tetraethyl lead in the gasoline will form deposits on the turbine blades and vanes. Continued use of mixed fuel may cause a loss in engine efficiency. However, there will be no detrimental effect on the engine if such usage is on a limited basis.

14. What may result if aviation gasoline that is contaminated with jet fuel is used in a reciprocating engine?
Gasoline which is contaminated with jet fuel is unsafe for use in a reciprocating engine and will result in complete engine failure.

15. When towing a large aircraft with a tow tractor, what brakes should be used to stop the aircraft?
When towing an aircraft, always apply the tractor brakes for slowing and stopping.

16. What are the safety requirements when starting and running a powerplant?
Use the correct checklist, position the aircraft into the wind, check the prop blast area, secure the external power cart and use a fireguard.

17. What are safety precautions when operating a drill press?
Wear eye and ear protection, clamp the workpiece securely, adjust for the proper RPM, stop machine completely before adjusting workpiece and clean the area when finished.

18. Why is a tire cage recommended when inflating aircraft tires?
To prevent possible personal injury should the tire or wheel fail.

19. What type of fire can a CO2 extinguisher be used on?
Class A, B, and C type fires.

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Subject G - Cleaning and Corrosion Control

1. What are the five common forms of corrosion?
F-DISS: Fretting, Dissimilar metal, Intergranular, Surface, and Stress corrosion.

2. Name at least three factors that influence corrosion?
The temperature, type of metal, availability of electrolytes and dissimilar metals, condition of protective coating.

3. What are the two general conditions that may cause stress corrosion cracking?
Sustained tensile stress, and a corrosive environment.

4. What is the cause of fretting corrosion?
It occurs when two mating surfaces, which are normally at rest with respect to each other, are subject to slight relative motion. It is characterized by pitting of the surfaces and the generation of large quantities of fine debris between the surfaces, identified as smoking rivets.

5. What is the principal cause of filiform corrosion?
Surfaces that have not had a proper chemical treatment prior to painting.

6. Where is intergranular corrosion most likely to occur?
Typically, along the grain boundaries of extruded materials.

7. What is another name for dissimilar metal corrosion?
Galvanic corrosion.

8. What are the factors which affect the type (form) of corrosion?
The form of corrosion varies with atmospheric conditions, size and shape of the metal, the type of metal, and the corrosion-producing agents present.

9. What methods are used for removing rust from aircraft materials?
Except on highly stressed steel surfaces (like oleo struts), the use of abrasive papers and compounds, small power buffers and buffing compounds, hand wire brushing and steel wool are all acceptable methods of removing rust.

10. What is an acceptable method for removing surface corrosion from titanium?
Several methods may be used including a stainless-steel brush, aluminum oxide sandpaper, Scotch Brite®, abrasive blasting using glass beads, or hand polish using aluminum polish and a soft cotton cloth.

11. What specific operations are part of corrosion-preventative maintenance?
Adequate cleaning, periodic lubrication, detailed inspection, prompt corrosion treatment, touch up of damaged paint, sealing, use of protective covers, and daily wipe-down of exposed critical areas.

12. Name the steps for corrosion removal.
Clean and strip the corroded areas, remove as much corrosion as possible, neutralize any residual material remaining in pits and crevices, restore protective surface films and paint.

13. What tools are approved for cleaning corroded anodized surfaces?
Fiber bristle brushes, aluminum wool, and aluminum wire brushes.

14. What is used to keep corrosion from forming on aluminum alloy?
An oxide coating or aluminum cladding.

15. What can be used to repair the anodized surface of an aluminum alloy part?
Alodine or other chemical conversion coatings.

16. What products should be used to clean an aircraft engine?
A fine spray of kerosene or solvent.

18. What should be used to clean grease, fuel, or oil from aircraft rubber tires?
Soap and water.

19. Why should only recommended cleaners be used on aircraft fabric and plastics?
Their use causes less degradation of the material.

20. Name 5 areas of an aircraft that are more prone to corrosion?
Battery compartments, bilge areas, wheel wells and landing gear, flap recesses, lavatory, galley, and other areas where water might be entrapped.

21. What form of corrosion can be found in battery compartments?
Direct chemical corrosion.

22. Why are piano-type hinges prime locations for corrosion?
Piano hinges use dissimilar metals (steel pins and aluminum hinges), and tend to trap contaminants between the pin and hinge surfaces.

23. What is used to neutralize a lead-acid battery electrolyte?
A solution of baking soda and water.

24. What is the difference between "wet wash" and "dry wash" aircraft cleaning?
Wet wash (water and an agent) cleaning is used to remove oil, grease, carbon deposits, and soils except for corrosion and oxide films. Dry wash (compressed air or cloth) cleaning is used to remove film, dust, and small accumulations of dirt.

25. What are types of light duty and heavy-duty aircraft cleaning agents?
Light duty cleaning agents are soap and synthetic detergent. Heavy duty cleaning agents are solvents and emulsion type cleaners.

26. What would you do before cleaning a wind screen?
Wet the surface before cleaning to prevent scratching.

27. What does filiform corrosion look like and where can it be found?
Filiform corrosion appears to look like thread or worm like puffiness of the painted surface. It occurs between the metal's surface and the protective coating.

28. How is the inside of structural tubing prevented from corroding?
Hot linseed oil can be poured into the hole, then the excess is drained.

Subject H – Mathematics

1. What is the formula for the area of a rectangle? **A = Length x Width.**

2. What is π? **Pi is a constant (3.1416) and is the ratio of the circumference to the diameter of any circle.**

3. What is the formula for the circumference to the diameter of any circle? ***C=πD***

4. What is the formula for the area of a circle? $A = \pi R^2$

5. What is the formula for the volume of a cylinder? $V = \pi R^2$ **xH (The area of a circle times height)**

6. What is the formula used for finding the volume of a rectangle? **V = L x W x H**

7. What is the root of a number? **The root of a given number is the base number that when multiplied by itself one or more times will produce the given number. (E.g., the root of 4 is 2; 2 x 2 = 4)**

8. Give examples of perfect square numbers. **4, 9, 16, 64, 100, 144 etc.**

9. What is a squared number? **A number that is multiplied by itself. For example, the square of two is four (2x2=4)**

10. How do you express a decimal as a percent? **Move the decimal two places to the right and add the percent sign. For example, .75 is 75%, or .375 is 37.5%.**

11. Using the powers of ten, how is 1,000,000 expressed? **Ten to the sixth power.**

12. What is scientific notation? **Representing very large or small numbers using powers of 10.**

13. What is the sum of a large negative number and a small positive number?
Subtract the smaller number from the larger number and use the sign of the larger number in the answer.

14. How is a ratio expressed?
A ratio may be expressed as a fraction, or it may be written using the colon (:) as a symbol for expressing a ratio. Thus, the ratio 5 to 7 may be written as 5/7 or 5:7.

15. What is a proportion?
A ratio that describes the relation between two objects of different dimensions.
16. How do you divide one fraction by another?
Multiply the first fraction by the reciprocal of the second fraction.

17. What is a right angle, obtuse angle, and acute angle?
A right angle is an angle of 90 degrees, an obtuse angle is an angle greater than 90 degrees and an Acute angle is an angle of less than 90 degrees.

18. What is a quadrant? **It is one quarter of a circle.**

19. What is a polygon? **A closed shape that is made up of three or more sides.**

20. What is a parallelogram? **A four-sided object with two pairs of parallel sides (rhombus).**

21. What is the hypotenuse of a triangle? **It is the long side that is opposite of the 90-degree angle.**

22. What is a mixed number? **It is a whole number followed by a fraction (2 ½)**

23. How can a decimal number be changed to a fraction?
Multiply the decimal value by the desired denominator; the result will be the numerator of the fraction.

24. Name some types of triangles. **Isosceles, equilateral, scalene, obtuse, acute, and right**

25. What is an equilateral triangle? **An equilateral triangle is a triangle in which all three sides have the same length.**

Subject I - Maintenance Forms and Records

1. What is the definition of airworthy, and where can it be found?
Airworthy means the aircraft conforms to its type design and is in a condition for safe operation. The definition is found in Title 14 CFR Part 3.

2. What is the definition of "time in service" with respect to maintenance time records?
"Time in service" means the time from the moment an aircraft leaves the surface of the earth until it touches down at the next point of landing.

3. What are the record requirements after performing maintenance?
1. Description of work performed (or reference to data acceptable to the Administrator).
2. Date of completion of the work performed.
3. Name of the person performing the work.
4. Signature, certificate number, and kind of certificate (person approving the work).

4. What are the record requirements after compliance with a 100 Hour Inspection?
1. Type of inspection and a brief description.
2. Date and aircraft total time.
3. Signature, certificate number, and kind of certificate (person approving or disapproving).
4. "I certify" statement.

5. What are the record requirements after compliance with an Airworthiness Directive (AD)?
1. Method of compliance (description).
2. AD number and revision date.
3. Time and date when the next action is required (if recurring).
4. Date, signature, certificate number (person approving the work).

6. Where should the description of a major repair or major alteration be recorded?
In the correct logbook and on the FAA Form 337.

7. What is the disposition of the two FAA Form 337s after they are completed?
You must give one copy to the aircraft owner and one copy is sent to the FAA Flight Standards District Office in Oklahoma City, Oklahoma.

8. What regulation authorizes a certificated mechanic with an IA to approve or disapprove a major repair or alteration?
Title 14 CFR 65.95

9. Who is required to make the entry in the aircraft records after a 100 Hour Inspection has been performed?
The appropriately rated and certificated mechanic that performed the work.

10. How long the record of a 100 Hour Inspection must be retained by the owner or operator?
Until the work is repeated or superseded by other work, or for one year after the 100 Hour Inspection was performed.

11. Where can a mechanic find the required data for a 100 Hour Inspection, maintenance record entry?
Title 14 CFR 43.11.

12. What is the minimum scope and detail that the checklist must contain when performing a 100 Hour inspection?
The checklist must include at least the items covered in Title 14 CFR 43, Appendix D.

13. Where is a 100-hour inspection recorded?
In the maintenance record of the applicable equipment, such as the airframe, engine, or propeller logbook.

14. When must an inspection entry contain the aircraft total time?
When an inspection entry, or AD entry is made.

15. When an aircraft is sold, what is done with the aircraft records containing the status of Airworthiness Directives?
All records containing the status of ADs must be transferred to the owner at the time of sale.

16. What type of maintenance record entry is required when an inspection under FAR 91.417 is made to a large airplane or a turbine engine-powered multiengine airplane and defects are found?
The entry must name the kind of inspection (continuous airworthiness inspection program, approved aircraft inspection program, etc.) And a signed and dated list of defects found must be given to the owner. (FAR 43.11 a-5)

17. Who may make a maintenance record entry for approval for return to service after a progressive inspection is performed?
An airframe repair station, Inspection Authorization, or the manufacturer.

18. What are the required entries in a new maintenance record for an engine that has been rebuilt and granted zero time by the manufacturer or by an agency approved by the manufacturer?
1. A signed statement with the date of rebuild.
2. Each change made as required by AD.
3. Each change made in compliance with the manufacturer's service bulletin if specifically requested in the SB.

19. What is an AD summary?
A list of all Airworthiness Directives (airframe, engine, propeller, and equipment) that pertain to an aircraft.

20. What are AD frequencies?
An update, they are issued bi-weekly.

21. Who is authorized to perform an annual inspection?
An inspection authorization.

22. Can a certificated A&P mechanic supervise an unlicensed person perform a 100-hour inspection?
No, only a certificated A&P mechanic can perform a 100-hour inspection.

23. What is meant by a progressive inspection?
It is a type of inspection program that must be approved by the local Flight Standards District Office that allows an annual/100-hour inspection to be segmented into various scheduled inspections. The purpose of a progressive inspection is to minimize the downtime an aircraft experiences during inspections when compared to performing an entire annual/100-hour inspection.

24. Who is authorized to rebuild and grant an aircraft engine zero time in the maintenance records?
Only the manufacturer, or an authorized representative of the manufacturer.

25. What is ATA 100 system?
A numbering system that is designed to standardize technical data regardless of the manufacturer.

Subject J - Basic Physics

1. What is matter? **Anything that occupies space and has mass.**

2. What are the different states of matter? **Solid, liquid, gas, plasma.**

3. What are two types of fluids? **Liquids and gasses.**

4. When a fluid passes through the middle section of a venturi, what pressure and velocity changes occur? **Pressure drops and velocity increases.**

5. Are liquids compressible? **No**

6. What is the standard atmospheric pressure at sea level? **14.7 psi or 29.92 inches of Hg (mercury).**

7. What is the standard day temperature? **59 degrees Fahrenheit.**

8. What is the name of the atmospheric phenomenon where cool air is trapped near the earth by warm air? **A temperature inversion.**

9. What is the speed of sound through the air under standard sea level conditions? **It is 662 knots, or 761 mph.**

10. What is meant by the density of air? **The mass of a given volume of air.**

11. What determines the density of the air? (In other words, density altitude.) **The temperature and pressure acting on it.**

12. What does specific gravity mean? **It is the ratio of a substance's density to the density of pure water.**

13. What are the three basic parts of a lever? **The fulcrum, force of effort, and resistance.**

14. What is a first-class lever, and give an example? **A first-class lever is when the fulcrum is located between the effort and the resistance. An example of a first-class lever is a seesaw.**

15. In what direction is force transmitted to a confined liquid? **Force is transmitted equally in all directions because it cannot be compressed.**

16. What is the formula for computing force, pressure, and area (Pascal's Law)? **Force equals pressure times area or F = P x A.**

17. What is kinetic energy? **Energy in an object created from its movement.**

18. What is potential energy? **Energy that is stored and can be turned into kinetic energy.**

19. What is absolute zero? **It is the temperature at which all motion of the atoms will cease entirely in a given sample of gas. It is -273°C.**

20. What are the two factors involved in work? **Force and movement through a measurable distance.**

21. How is pressure expressed in hydraulics and pneumatics? **It is expressed in pounds per square inch (psi).**

22. Name the forms of energy that can be converted into heat energy? **Mechanical, electrical, chemical, radiant, nuclear, and solar.**

23. What are the three methods of heat transfer? **Conduction, convection, and radiation.**

24. What are the three types of friction? **Rolling, Sliding, and Static**

25. What are the four forces experienced by an aircraft in flight? **Gravity, thrust, lift, and drag.**

26. What is an autorotation? **An autorotation is when the helicopter rotor blades spin without engine power as air flows through the rotor.**

27. How does blade flapping help compensate for dissymmetry of lift in helicopter main rotor systems?
By increasing the angle of attack on the retreating blade, and decreasing angle of attack on the advancing blade.

28. What is the name of the imaginary line that runs from the leading edge to the trailing edge of an airfoil? **Chord line.**

29. What function do wing mounted vortex generators serve?
Vortex generators prevent airflow separation from the upper surface of the wing.

30. What is directional stability? **The ability of an aircraft to avoid yawing.**

31. What is magnetism? **Motion of an electric charge, resulting in attractive and repulsive forces between objects.**

[redacted] [redacted]

Subject K- Maintenance Publications

1. What is the purpose of Airworthiness Directives?
They are used to notify owners and mechanics of conditions that prevent a product or part from being in airworthy condition.

2. What FAA publication is used to notify aircraft owners of unsafe conditions? **Airworthiness Directives.**

3. When must an Airworthiness Directive be complied with?
All ADs must be complied with in accordance with the compliance requirements set forth in the AD.

4. When is the summary of ADs published? **Every other year.**

5. Are ADs automatically issued to certificated mechanics? **No, they are issued to owners.**

6. Where can you find a list of approved engines for use in a specific model aircraft?
The type certificate data sheet (TCDS).

7. Where can the dimensional tolerances be located for a wrist pin installed in an aircraft engine?
In the overhaul manual for that engine.

8. Where can the empty weight of an airplane be located? **In the aircraft weight and balance logs.**

9. Where can you find Airworthiness Standards for normal category airplanes? **Title 14 CFR 23.**

10.Where can you find Airworthiness Standards for transport category airplanes? **Title 14 CFR 25.**

11.What federal regulation defines the requirements for the issue of Type Certificates? **Title 14 CFR 21.**

12.Where would you look to find out if a specific airplane can be certified in more than one category?
The type certificate data sheet (TCDS).

13.What publication is issued by airframe, engine, and component manufactures to notify aircraft owners of design defects? **Service Bulletins.**

14.What publication contains complete instructions for maintenance of all systems and components installed in an aircraft? **The manufacturer's aircraft maintenance manual.**

15.What manual is prepared by the manufacturer for technicians who normally perform work on products, parts, and systems while installed in the aircraft? **The aircraft maintenance manual.**

16.Who is responsible for ensuring that only the most current information is used when performing any maintenance on an aircraft? **The person authorized to approve the maintenance.**

17. What are FAA Advisory Circulars? **They are non-regulatory FAA publications that expand upon and explain existing rules and regulations.**

18. On older aircraft for which manuals are not available, what publication could be used to inspect and maintain the aircraft? **The AC 43.13.**

19. When are Service Bulletins considered mandatory?
When they are referenced within the Airworthiness Directive (AD).

20. Are statements included in the Federal Aviation Regulations mandatory or optional to be complied with?
Mandatory.

21. When would you complete the FAA Form 337 in triplicate? (When would you have to complete three 337s?)
When installing extended range fuel tanks in the baggage or passenger compartment. One is given to the owner, one is sent to the FAA within 48 hours after the aircraft is approved for return to service, and one is placed on board the aircraft.

22. What is the purpose of a minimum equipment list (MEL)?
The MEL permits aircraft to be flown with inoperable non-essential equipment long enough for repairs to be made.

23. At what weight is an aircraft classified as large? **12,500 pounds and above.**

24. What is the normal disposition of the FAA Form 337 when there are NO extended range fuel tanks?
One copy is given to the aircraft owner/operator and the other copy is sent to the FAA.

25. What is a MSDS or more commonly called an SDS? ***Material Safety Data Sheet or Safety Data Sheet*. A MSDS or SDS is a *document that contains information on the potential hazards* (health, fire, reactivity and environmental) and how to work safely with the chemical product.**

Subject L - Aviation Mechanic Privileges and Limitations

1. Which Federal Regulation prescribes the certificate requirements for a mechanic? **Title 14 CFR 65.**

2. What is the minimum age for an A&P mechanic certificate? **18**

3. What are the two ratings that can be issued to a mechanic certificate? **Airframe and Powerplant.**

4. What are the limitations of a certified mechanic regarding aircraft instruments?
   A mechanic may not calibrate or make any repairs or alterations to aircraft instruments.

5. What are the privileges and limitations of a certified mechanic regarding propellers?
   A Powerplant mechanic may make minor repairs and alterations, but may not make major repairs or major alterations to propellers.

6. What type of work may a certificated mechanic accomplish on aircraft?
   They may perform or supervise maintenance, preventive maintenance, and alterations.

7. When a mechanic has a permanent change of address, what must be done within 30 days after the change?
   They must notify the Administrator of the FAA in writing or online at www.faa.gov.

8. What is the duration of a certified mechanic? **It is effective until Surrendered, Suspended, or Revoked.**

9. How long is a temporary mechanic certificate in effect? **For a period of 120 days.**

10. What is used as a guide to determine if a repair is a major or minor repair? **Title 14 CFR 43, Appendix A.**

11. What are the requirements of recent experience for a mechanic? **A certificated mechanic must supervise or perform maintenance for at least six months out of every 24 months.**

12. What may be used as a guide for 100-hour inspections? **Title 14 CFR 43, Appendix D.**

13. What are the privileges of a certified mechanic regarding performing a 100-hour inspection and returning an aircraft to service? **A certified A&P mechanic may perform a 100-hour inspection and return an aircraft to service by making the proper entries in the maintenance records.**

14. What are the privileges of a certificated mechanic with respect to an annual inspection?
    A certificated A&P mechanic with an inspection authorization may perform an annual.

15. Can an A&P supervise personnel without an A&P certificate in performing maintenance and/or 100-hour inspections? **An A&P may not supervise a 100-hour inspection.**

16. Who has final responsibility for maintaining aircraft maintenance records? **The owner or operator of the aircraft.**

17. May an airframe mechanic perform maintenance on engines?
    Yes, under the supervision of a Powerplant mechanic.

18. What privileges are given to a Powerplant mechanic in addition to the ability to perform maintenance?
They may perform a 100-hour inspection on a propeller or engine.

19. What maintenance can a pilot perform and what are the limitations?
They may approve an aircraft for return to service after performing preventive maintenance (except for commercial aircraft).

20. How long must a mechanic wait before reapplying for their A&P certificate after losing their certification?
1 year.

21. What should you do if your temporary certificate becomes older than 120 days?
Contact your local Flight Standards District Office (FSDO).

22. Who must approve for return to service, radio equipment installations made in accordance with supplemental type certificates? **Any IA.**

Section II – Airframe Structures

Oral Questions

Section II – Airframe Structures (7 Subjects)		
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Subject A - Wood Structures

1. What species of wood is used as a standard for strength properties of other species of wood used in aircraft structures? **Spruce is used as the standard of which all woods are compared.**

2. Is northern white pine an acceptable substitute for spruce?
Yes, but only if the pine is a larger size to make up for its lower strength.

3. Are knots allowed in aircraft wood?
Knots are allowed if within limitations. Factors that determine if knots are acceptable include the type of knot, location, spacing, and number of knots.

4. What type of wood quality must be used in the repair of aircraft structures?
The wood must be of aircraft quality and equivalent to its original strength or greater.

5. What is the difference between laminated wood and plywood?
Laminated wood and plywood consist of two or more layers of wood which have been glued together. Laminated wood has the grain of all layers approximately parallel. The grain of plywood runs 90° with the adjacent ply.

6. What are two types of glue used for aircraft wood structure repair?
They are casein and synthetic resin glue. The resin glues that are recommended for wooden aircraft applications are the resorcinol formaldehyde type glues.

7. What method is used to prepare plywood for bending?
The wood is soaked in hot water, and then placed in a form until completely dry.

8. What are the results of using insufficient gluing pressure when making a wood joint?
The results will normally be thick glue lines, which indicate a weak joint.

9. What is the recommended clamping pressure for a glued joint? **125 to 150 psi.**

10. How long should a wood glue joint be kept under pressure before removing the clamps?
The pressure time will vary depending on the temperature of the curing room. The curing temperatures are from 70°F and up. Higher temperatures will cause the glue to set faster. To be certain that a glue joint is satisfactory, it is recommended that it remain under pressure at about 85°F for a period of at least seven hours. Full joint strength will develop only after conditioning for at least two days.

11.What are some of the various methods used to apply pressure to joints in aircraft gluing operations?
Brads, nails, screws, clamps, or hydraulic and electric power presses.

12.Why does the strength of a scarf joint depend upon the accuracy of the two beveled surfaces?
Because an inaccurate bevel will reduce the amount of effective glue area.

13.Why is sanding unacceptable when preparing a joint for splicing?
Because the dust created from sanding will clog the pores of the wood, preventing proper penetration of glue.

14. What type of patch is preferred for repair of stressed plywood skin and why?
A properly prepared and inserted scarf patch is the best repair for plywood, and is preferred for most skin repairs. It differs from a splayed patch in that the edges are scarfed to a 12 to 1 slope instead of a 5 to 1 slope, and it uses reinforcements under the patch where the glue joints occur.

15. Are mineral streaks acceptable in aircraft wood? **Yes, providing careful inspection fails to reveal any decay.**

16. How do you inspect for decay/rot in wood?
Visual (dark discoloration or gray stains), **Odor** (musty or moldy), **Tapping** (sharp solid report), **Probe** (Sharp metal tool), **Prying** (bonded joints)

17. How can the moisture content of wood be determined?
One way is to use a moisture meter. However, the most accurate method is to take a sample of the wood, weigh it, dry it in an oven at a temperature of 100°C to 105°C, reweigh it, and then compute the moisture content by using the following formula.

$$\frac{W1 - W2}{W2} x100$$

w1= the weight of the wood sample before drying.
w2 = the weight of the wood sample after drying.

18.What area of the wood spar may not be spliced?
It may not be spliced under wing attachment fittings, landing gear fittings, engine mount fittings, or lift-and-interplane strut fittings.
19.What type of joint is generally used in splicing structural members in aircraft? **A scarf joint.**

20.What is compression wood and why is it not acceptable for aircraft structures?
Compression wood is wood that is characterized by high specific gravity and has the appearance of an excessive growth of summer wood (hard, non-porous). This defect is difficult to recognize and is very detrimental to strength. Reject all material containing compression wood.

21. What are three forms of wood? **Solid, Ply, and Laminate.**

22.What are two forms of wood that are acceptable for the repair of wooden aircraft skin?
The plywood and laminated woods are preferred for this application.

23.What would be the greatest number of splices placed into one spar? **Two.**

24.What is the largest hole diameter that can be repaired in a plywood wing skin when using a fabric patch? **1 Inch**

Subject B - Aircraft Covering

1. What determines the required quality and strength of fabric that is to be used for covering aircraft?
The required strength and quality of aircraft fabric is determined by the pounds per square foot of wing loading (PSF), and the never-exceed airspeed of the aircraft (VNE).

2. When are anti-tear strips recommended and where are they used?
Anti-tear strips are installed over the ribs, longerons, and stringers but are under the reinforcing tape before the fabric is installed. They are recommended for all areas in the slipstream.

3. What is the maximum permissible deterioration of aircraft fabric before it is considered unairworthy?
Fabric covering is considered unairworthy when it deteriorates more than 30 percent from its original required tensile strength.

4. What should be the strength of the fabric used for re-covering an aircraft?
All fabric, surface tape, reinforcing tape, thread and lacing cord used to re-cover or repair an aircraft covering should be of high-grade aircraft textile material. The material must be at least as good quality and of equivalent strength as those originally used by the aircraft manufacturer.

5. What is the purpose and location of drain grommets in aircraft fabric?
They allow the condensed moisture to leave the aircraft as well as furnish ventilation. Drain grommets are located on the underside of airfoils at the trailing edge as close to the rib as practical, and at the lowest point along the center of the underside of each fuselage bay.

6. How are drain grommets installed in aircraft fabric?
Brass grommets should be mounted on fabric patches and then doped to the covering. Plastic grommets are doped directly to the covering. Both types are installed with a second coat of dope, and the drain holes are opened by cutting out the fabric in the center of the grommet.

7. Name the methods of applying fabric to an aircraft wing. **Blanket and envelope method.**

8. What is the purpose of reinforcing tape? **Reinforcing tape is used under all stitching and prevents the stitching cord from tearing through the fabric.**

9. What type of fabric is not affected by moisture or mildew? **Fiberglass fabric is not affected by moisture, mildew, chemicals, and most acids.**

10. What methods are used to check the strength of doped fabric? **A fabric punch test (Maul Test) will provide a general indication of the strength of the fabric, but if a punch tester indicates that the fabric strength is marginal, a laboratory test should be performed to determine the actual strength of the fabric.**

11. What type of machine-sewed seems are used in aircraft covering?
Plain overlap seams, folded-fell seams, and French-fell seams.

12. What should be done with structure that will come in contact with doped fabric?
Treat all parts of the structure that will come in contact with doped fabric with a protective coating such as aluminum foil, dope proof paint, or cellulose tape.

13. If the original rib stitch spacing cannot be determined when re-covering an aircraft, where can you find the rib stitch spacing that should be used? **Use the rib stitch spacing chart in the AC 43.13-1B.**

14. What is the standard tie-off knot used during rib stitching?
A modified seine knot is used to tie off all stitches except the starting stitch.

15. What do you call the edge of cloth, tape, or webbing that has been woven to prevent raveling? **Selvage edge.**
(This question has been known to be reversed) The answer is the question.

16. The type of fabric used for covering aircraft are organic and synthetic. Name two organic and two synthetic types. **The organic fibers are cotton and linen. The synthetic fibers include fiber glass and heat shrinkable synthetic fibers such as nylon and Dacron.**

17. When covering aircraft, where is surface tape used? **Sewed seams, lapped edges, and all stitching is covered with surface tape. The surface tape has a pinked edge to prevent unravelling during the installation process.**

18. Name the advantages of using the envelope method to cover fabric aircraft.
It saves labor because practically all sewing is done by machine. It is like pulling a sock over the wing. The only stitching left to do would be to the structure.

19. How are wrinkles removed from cotton fabric? **By wetting the wrinkles and allowing it to dry.**

20. When is finishing tape applied? **After the second coat of dope is dry, and the nap has been sanded away.**

21. How wide should surface tape be when used to cover the trailing edge of an aircraft wing? **Three inches.**

22. What is the recommended type of repair for an L-shaped tear when the legs are more than 14 inches long?
A doped-on patch, if the never-exceed velocity is less than 150 mph.

Subject C - Aircraft Finishes

1. Name the safety and health precautions to be observed in operating a dope room, including storage of material. **The dope room should be well lighted and ventilated using spark proof motors, lights, and switches. All flammable material should be stored in fireproof containers in protected areas. Dope and paint rooms that are not located in a separate building should be isolated from the rest of the building by metal partitions and fireproof doors.**

2. What primer is used when maximum protection of the metal is desired? **Epoxy.**

3. What type of test can be performed to identify existing paint finishes?
Apply a coat of engine oil to a small area. Nitrocellulose will soften in a few minutes, but acrylic and epoxy will show no effects. If not identified, next wipe down a small area with MEK. MEK will pick up pigment from an acrylic finish but will not affect an epoxy coating.

4. What causes blushing when applying dope or lacquer, and how can it be prevented?
When doping is accomplished under humid conditions, blushing is possible. Rapid evaporation of thinners and solvents lower the temperature of the surface of the wet dope causing condensation of moisture from the air. The moisture causes a milky white or cloudy appearance known as blush. The condition may be eliminated by heating the room to decrease humidity, or by using a blush-retarding thinner to increase the drying time. Blushing is also caused by moisture in the air supply, drafts, or change in temperature.

5. What is the purpose of using fungicidal dope when finishing aircraft fabric? **To prevent micro-biological deterioration (rotting) of the fabric.**

6. What are the identification marking requirements for United States registered fixed wing aircraft?
The *Roman capitol letter "N"* followed by the registration number must be displayed on *both sides of the fuselage, or on both sides of the vertical tail surfaces*. The height of the characters must be equal in size and be at least *12 inches*, and the characters must be 2/3 as wide as they are high. The exceptions to the width rule are the number "1", which must be 1/6 as wide as it is high, and the letters "M" and "W", which may be as wide as they are high. Characters must be *formed by solid lines 1/6 as thick as they are high*, and the spacing between each character may not be less than 1/4 of the character width.

7. What should the color of registration markings be? **The color of markings should contrast their background.**

8. What are two types of dope used for aircraft finishes? **They are nitrate and butyrate.**

9. What is the advantage of butyrate over nitrate? **Less flammable.**

10. What would happen if dope was ever used over paint or enamel? **It would have the tendency to lift and remove such materials.**

11. What is applied to metallic surfaces as a common resistant covering before the application of enamel or lacquer? **Zinc chromate primer is normally used for this purpose.**

12. What can be done to the surface of components to prevent filiform corrosion? **Ensure that the primer is completely cured.**

13. What are the most common methods of applying aircraft finishes? **They are dipping, brushing, or spraying.**

14. What type of paint may be used over any paint system that is in good condition?
Epoxy topcoats will adhere to all paint systems that are in good condition and may be used as a general touchup, including touchup of defects in baked enamel coatings.

15. What normally causes runs and sags in a spray application of a paint finish?
Holding the gun too long in one place or holding the gun too close can cause too much paint to be applied in one area.

16. What causes an "orange peel" or "pebble" finish?
Incorrect spray gun setting, incorrect air pressure, incorrect paint viscosity, and holding the gun too far from the work.

17. What causes fisheyes in paint? **Surface contamination.**

18. What is used to thin chromate primer? **Toluene.**

19. Which federal regulation prescribes the size and location requirements for aircraft identification numbers? **FAR Part 45.**

20. What type of materials should be thoroughly protected when using paint remover?
Synthetic rubber surfaces, aircraft tires, fabric, and acrylics must be protected against possible contact with paint remover.

21. What instructions should be followed when covering an aircraft with materials specified in an STC?
The instructions are included in the STC.

22. What is the principal cause of filiform corrosion? **Uncured primer.**

23. What is zinc chromate used for? **Primer for bare metal.**

24. What does paint blushing look like? **Dull and hazy surface finish.**

25. What causes paint dust? **Poor surface prep and overspray.**

26. What types of paint are generally used on aircraft? **Epoxy and enamel.**

Subject D - Sheet Metal and Non-Metallic Structures

1. What is the grip length of a rivet? **The grip length is the combined thickness of the materials to be joined by the rivet.**

2. Where are special rivets, such as Huck or Cherry lock rivets used?
They are used in places where access to both sides of the riveted structure is impossible, or where limited space will not permit the use of a bucking bar. These rivets require special tools, installation, and removal procedures. They are commonly called blind rivets.

3. What is bonded honeycomb (sandwich) construction?
It is a *laminar construction* consisting of a combination of *alternating dissimilar materials*, assembled and fixed in relation to each other so that the properties of each can be used to attain specific structural advantages for the whole assembly while reducing weight.

4. What type of materials are used in honeycomb construction?
Honeycomb construction may employ stainless steel, titanium, magnesium, plywood, resin impregnated paper, E-glass, nylon in various combinations.

5. Where are sandwich construction assemblies used?
They are used for such areas as bulkheads, control surfaces, fuselage panels, wing panels, radomes, empennage skins, or shear webs.

6. What procedures should be used to prevent damage to the hole when drilling though Plexiglas?
The Plexiglas should be *backed with wood* and the *feed slowed* as the drill point breaks through the underside of the sheet. A drill bit that is to be used for this purpose should be *modified to a 60° tip angle*, the cutting edge to a zero-rake angle, and the back lip clearance angle increased to 12-15 degrees.

7. What calculations must be made when bending sheet metal?
***Setback and bend allowance* must be determined. Set back depends on two factors: (1) radius, (2) thickness. Bend allowance depends on four factors: (1) the degree of bend, (2) the radius of the bend, (3) the thickness of the metal, and (4) the type of metal used. The amount of material required for the bend must be determined to assure that the final dimensions will be correct. Bending a strip of metal compresses the materiel on the inside of the curve, and stretches the material on the outside of the curve. However, in the approximate center between these two extremes is a space that is neither stretched nor compressed which is called the neutral axis. When making a bend to exact dimensions, the length of the neutral line must be calculated so enough material can be allowed for the bend.**

8. What factors are used to determine setback? **The radius of the bend and the thickness of the material. Setback= Radius+ Thickness.**

9. When bending sheet metal, how should the grain be in relation to the bend? **The grain should be perpendicular to the bend.**

10. What is a bend tangent line? **The line at which the metal starts to bend.**

11. What is a joggle? **A joggle is an offset near the edge of a piece of sheet metal to allow clearance for a sheet or extrusion.**

12. What are several methods used in forming sheet metal? **Folding, bumping, crimping, shrinking, and stretching.**

13. What kind of metal forming is done by bumping? **Compound curves.**

14. What is crazing and how does it occur? **Hairline cracks in the surface of plastic. A form of heat damage caused by uneven heating, one side expanding more than the other causing excessive stress. Subjecting plastic to large stresses and exposure to harmful solvents will cause crazing.**

15. Briefly describe the anodizing process and what purpose it serves.
Aluminum alloys are placed in an electrolytic bath which causes a thin film of hydroxide to form on the surface of the aluminum. This anodized coating not only provides excellent resistance to corrosion, but it is also an excellent bond for paint.

16. What are the proper dimensions for the shop head of a rivet? **1.5 times the diameter in width and .5 times the diameter in height after bucking.**

17. When inspecting Plexiglas, what should you look for? **Crazing and discoloration.**

18. What causes honeycomb structure to delaminate? **Moisture.**

19. What are the acceptable repair methods for bonded honeycomb structure that has been damaged?
There are two acceptable methods of repair currently being used on damaged skin and core materials of bonded honeycomb structures. One is the potted repair method. The other is the laminated glass fabric cloth overlay which is applied to honeycomb damage which exceeds the repair limitations of the potted compound method.

20. What size drill should be used for the common shank rivet diameters of 3/32 inch, 4/32 inch, and 5/32 inch?
For a 3/32 rivet, a number 40. For a 4/32 rivet, a number 30. For a 5/32 rivet, a number 21.

21. What is used for hole filling in a bonded honeycomb repair? **Potting compound.**

22. What is a lightening hole? **Lightening holes are cut into rib sections, fuselage frames, and other structural parts to decrease weight. Flanges are pressed around the holes for strength.**

23. What special precautions should be observed when repairing a radome?
The repair must retain its strength and electrical transparency.

24. What is a warp line? **A highlighted strand in the fabric used for ply orientation.**

25. What does "pot-life" mean? **The length of time a resin will remain workable after the catalyst has been added.**

26. What is a Barcol hardness tester?
A device that pushes a spike into material such as composites. The depth of penetration can be measured to determine if resins in the composite have cured.

27. What is done to honeycomb before repairing? **Remove damaged honeycomb and either replace with potting compound or use a honeycomb replacement plug.**

Subject E – Welding

1. What type of weld joint must be used to weld magnesium?
Only butt welds are used to weld magnesium. This is to prevent the possibility of trapping contaminates.

2. Why must all flux be removed from the metal after welding magnesium?
Any flux left on the metal will result in severe corrosion.

3. What must be done to successfully weld titanium?
The weld zone must be shielded with an inert gas such as Helium or Argon.

4. What is gas shielded arc welding? **A gas is used as a covering shield around the arc to prevent the atmosphere from contaminating the weld.**

5. What are the advantages of gas-shielded arc welding? **It results in a stronger, more ductile, and more corrosion resistant weld.**

6. What shielding gasses are used for gas tungsten arc (TIG) welding? **Helium and argon.**

7. What is an advantage of electric arc welding over gas welding? **It causes less buckling and warping of the welded material.**

7. What determines the amount of heat that will be applied to the work when welding by the oxyacetylene method? **The torch tip's orifice size or diameter.**

8. What is meant by a soft flame? **A soft flame is when the torch is adjusted so the flame makes no noise and doesn't push the weld puddle.**

9. When gas welding, what should be turned off first?
First shut off the acetylene, then the oxygen source. *"**A** comes before **O**"*

10. What will be the result of using a torch tip that is too large or too small?
If the torch tip is too large, the heat will be too great, and holes may be burned in the metal. If the torch tip is too small, the heat provided may be insufficient to produce penetration to the proper depth causing a low strength weld.

11. How do you determine the correct size filler rod to be used in welding?
The diameter of the rod to be used is governed by the thickness of the metals being joined. Welding rods are made in standard 36-inch lengths, and in diameters from 1/16 to 3/8 inch. If the rod is too small, it will not conduct heat away from the puddle rapidly enough, and a burned weld will result. A filler rod that is too large will cool the puddle too quickly and not allow the proper penetration.

12. What is the function of flux when used in soldering?
Flux erodes corrosion from the surface of the metal when it is heated so the solder can form a strong bond.

13. Why must acid-core solder never be used on electrical wire?
Any acid flux that is left over will cause severe corrosion to the wire.

15. What is brazing? **Brazing is a metal joining process in which the bonding material is a non-ferrous metal with a melting point lower than that of the metals being used. It includes silver soldering, copper brazing, and aluminum brazing. It can be used to join metals that are damaged by high heat.**

16. What is one method of controlling expansion when welding a joint? **By tack welding at intervals along the joint.**

17. Why is it especially desirable to use a soft flame when welding aluminum? **To avoid blowing holes in the metal when the puddle is formed.**

18. What fuel is used for gas welding aluminum? **Oxygen and hydrogen.**

19. What is the purpose of using flux when welding aluminum?
Aluminum and its alloys combine with air and form oxides very rapidly, and oxides form doubly fast if the metal is hot. Aluminum welding flux is designed to remove the aluminum oxide by chemically combining with it. Aluminum fluxes dissolve below the surface of the puddle and float the oxides to the surface where they can be removed.

20. What is the maximum safe pressure for acetylene gas when welding?
When acetylene gas is compressed in a container to a pressure greater than 15 psi, it becomes dangerously unstable. At 29.4 psi, acetylene is self-explosive and only a slight shock can cause it to ignite.

21. How can dents at a steel tube cluster joint be repaired? **Weld a specially formed steel patch over the dented area and surrounding tubes.**

22. What type of flame should be used when silver soldering? **The flame should be neutral.**

23. What are the procedures for preparing a metal fuel tank for welding?
The interior of the tank should be washed with hot water and detergent, and then steamed for a minimum of thirty minutes. This procedure will vaporize and remove any residual fuel in the tank. Then fill the tank with CO2 gas from a fire extinguisher and seal the tank except for a small vent hole.

24. When splicing tubing by the inner sleeve method, what method can be used to insert a tight-fitting inner sleeve into the replacement tube? **The inner sleeve can be chilled with dry ice or in cold water, and the outer sleeve can be heated. This will allow for a tighter fit repair.**

25. Why is flux used on silver solder? **It cleans the base metal of oxide to ensure a good bond.**

26. Name some types of welding. **Oxyacetylene, Gas Shielded, Brazing, Arc, Plasma.**

Subject F - Assembly and Rigging

1. What are three types of commonly used flight control systems?
They are the cable, the push-pull tube, and the torque tube systems. The cable system is the most widely used because deflections of the structure to which it is attached do not affect its operation.

2. What is used in large metal aircraft to keep control cable tension within acceptable limits? **A cable tension regulator.**

3. What is a fairlead?
It is a cable guide that slightly deflects straight run cables around structural features such as bulkheads or lightning holes.

4. How much is cable deflection is acceptable due to a fairlead? **3°**

5. Where does failure of control cables occur most frequently? **Breakage of wire strands occur most frequently where cables pass over pulleys and through fairleads.**

6. Which flight control surfaces are considered the primary group? **The elevators, the ailerons, and the rudder.**

7. Which flight controls are considered the secondary group?
The trim tabs, spring tabs, wing flaps, servo tabs, and the anti-servo tabs. They do not alone cause rotation of the aircraft about its axes.

8. Which flight controls are in the auxiliary group?
Think of these as HIGH LIFT devices for slow speed flight. ***Trailing Edge Flaps, Slats, Slots, Speed Brakes etc.***

9. How do wing flaps affect landing speed and approach angle of an aircraft?
The use of flaps increases the camber of a wing and therefore the lift of the wing, making it possible for the speed of the aircraft to be decreased without decreasing the lift produced by the wing. This permits a steeper glided angle and lower speed to be obtained for the landing approach.

10. What is a balance tab? **It is an auxiliary control with fixed linkage that is designed in such a way that when the primary control surface is moved the tab moves in the opposite direction. Aerodynamic forces (back pressure) acting on the tab assists the pilot in moving the control surface.**

11. What is a trim tab? **It is an auxiliary control attached to the trailing edge of the primary control surface that is positioned by movement of a cockpit control to reduce the workload on the pilot in maintaining a desired flight attitude.**

12. What is the purpose of the collective pitch control in a helicopter?
It is used to change the pitch of the main rotor blades therefore increasing or decreasing lift.

13. Why is it important for the blades of a helicopter rotor system to be tracked? **To reduce vertical vibrations.**

14. What is the most efficient way to check a helicopter rotor for dynamic balance? **The use of a balance/analyzer computer.**

15. What unit on a helicopter is used to compensate for torque created by the main rotor? **The tail rotor.**

16. What control operates the helicopter tail rotor? **The anti-torque pedals.**

17. What are the three axes of an aircraft, and which control surfaces cause the aircraft to move about each axis? **They are the longitudinal, the lateral, and the vertical. The longitudinal axis extends from nose to tail and uses ailerons for roll. The lateral axis extends from wingtip to wingtip using the elevators for pitch. And the vertical axis passes through the center of the airframe from top to bottom, and uses the rudder for yaw.**

18. When installing an aircraft bolt, what precaution would you take regarding the position of the bolt? **Where possible, the bolt head should be positioned on top when a bolt is installed vertically, and the bolt head should be forward when it is installed horizontally. In these positions the bolt is less likely to slide out if the locking device fails.**

19. How is the propeller torque corrected for during assembly and rigging in some single engine aircraft? **Some aircraft have the leading edge of the vertical stabilizer offset to the longitudinal center line to counteract engine torque.**

20. What reference publications should be used to rig aircraft, including the control system? **You should refer to the Aircraft Specifications or Type Certificate Data Sheets issued by the FAA, and the Maintenance Manual issued by the manufacturer.**

21. What are vortex generators? **Small, low-aspect-ratio airfoils mounted on the upper surface of wings. Their function is to dampen shock-induced separation of the airstream which results in a stall.**

22. What is a servo tab? **A cockpit controlled adjustable tab attached to the trailing edge of a primary control surface. The tab moves opposite the direction of the control surface producing an aerodynamic force that moves the primary.**

23. What factors are used to determine the proper cable tension? **The size of the cable and the outside temperature.**

24. Why do control surfaces need to be statically balanced? **Because an out of balance control surface can cause severe flutter.**

25. What is a spring tab? **A flight control that uses a spring to assist control surface movement at high speeds.**

26. What tool can be used to measure control surface travel? **A protractor.**

Subject G - Airframe Inspection

1. What needs to be done to prepare an aircraft for an annual or 100-hour inspection?
Remove or open all necessary inspection plates, access doors, fairings, and cowlings. Then thoroughly clean the aircraft and the engine.

2. What is the difference between an annual and 100 -hour inspection?
Except for the difference in time between inspections and the person who can sign it off, there is no difference between the annual and the 100-hour inspection. They are identical in scope and detail.

3. Who has the authority to sign off and return to service a 100-hour inspection?
An appropriately rated mechanic may return an aircraft to service after a 100-hour inspection.

4. What are the operating conditions which make the 100-hour inspection mandatory?
The 100-hour inspection is required for aircraft that carry persons for hire or is used to give flight instruction for hire.

5. Where can you find a checklist for the 100-hour inspection? **In FAR Part 43, Appendix D.**

6. Where would you find the recommended statement for recording the approval or disapproval for return to service of an aircraft after a 100-hour inspection? **In FAR Part 43.11.**

7. Who can approve an aircraft for return to service after an annual inspection? **An A&P mechanic who holds an Inspection Authorization (IA) certificate.**

8. Who can approve an aircraft for return to service after a progressive inspection has been performed?
A certified mechanic holding an Inspection Authorization, the aircraft manufacturer, or a certified repair station.

9. Does an aircraft being operated under a progressive inspection program require a 100-hour inspection if it is used to give flight instruction for hire? **No.**

10.What is the maximum time that a 100-hour inspection may be extended? **Not more than 10 hours. The 10 hours may only be used to ferry the aircraft to the next inspection site.**

Section III – Airframe Systems and Components

Oral Questions

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Subject K - Aircraft Landing Gear Systems

1. What are two sources of power used to extend and retract landing gear? **They are electrical and hydraulic.**

2. When should landing gear retraction checks be accomplished? **During annual and other type inspections, after replacing landing gear components, and after any hard landing.**

3. What is used to inflate an oleo type landing gear shock strut? **Inflate the strut with a high-pressure source of dry air or nitrogen.**

4. Where would you look to find proper tire inflation information?
When inflating aircraft tires, the amount of pressure is determined by such factors as tire size, outside air temperature, and the gross weight of the aircraft. Specific tire inflation information may be found in the Operation Manual and the Aircraft Maintenance Manual in special tire inflation pressure charts based on gross weight.

5. What is the purpose of a hydraulic shimmy damper? **It is a unit designed to prevent nose wheel vibrations or "shimmy" during taxiing, landing, or takeoff.**

6. What type of care should be given to landing gear shock struts?
They should be inspected regularly for leakage of fluid and for proper extension. The exposed portion of the strut piston should be wiped clean daily and inspected for scoring or corrosion.

7. What is the effect of under inflated tires?
Under inflated tires are more likely to creep or slip on the wheel when landing or when brakes are applied. Under inflation also causes rapid, uneven wear at or near the edges of the tread.

8. What is the purpose of the rubber O-ring mounted on the mating surface of the outer wheel half of a split type wheel? **To prevent air leakage from the tubeless tire used with this wheel.**

9. What are three types of aircraft brake systems? **The independent, the power boosted, and the power control type.**

10. What is the purpose of a shuttle valve in a power control system?
Each brake actuating line in a power brake system incorporates a shuttle valve for the purpose of isolating the emergency brake system from the normal brake system. When emergency brake actuating pressure enters the shuttle valve, the shuttle is systematically moved to the opposite end of the valve. This closes off the normal hydraulic brake system actuating line and allows the emergency fluid to actuate the brakes.

11. What is the purpose of the main landing gear Torque link? **Keep the landing gear in alignment.**

12. What is used to prevent a nose gear from being retracted with the wheel out of the center position?
Centering devices, such as an internal centering cam or an external track that straighten the nose wheel before it enters the wheel well.

13. What is used in a split wheel assembly to keep the air from leaking out between the wheel halves? **An O-ring.**

14. What is the purpose of the fusible plug in some aircraft wheels? **It is designed to melt at a specific temperature and relieve air pressure to prevent the tire from blowing out or damaging the wheel.**

15. How should aircraft tires be stored? **They should be stored in a cool, dry place, away from chemicals, oil, or sunlight.**

16. What is the most important maintenance consideration for aircraft tires? **Ensuring they are properly inflated.**

17. What safety procedure should be followed when inflating tires in general? **They should be inflated inside of a cage whenever possible.**

18. What is the purpose of the anti-skid system? **To bring the airplane to a stop without skidding by providing the most effective braking power under all types of runway conditions.**

19. What task should be accomplished if the aircraft brakes are spongy? **The brakes need to be bled.**

20. What are two methods of bleeding brakes? **The gravity method and the pressure method.**

21. When inspecting brakes, what do you look for?
1. Check for leaks while the system is pressurized.
2. Check flex hoses for swelling, cracking, or soft spots.
3. Check brake pedals for spongy actuation. (This is an indication of air in the system.)
4. Check brake pedals for excessive travel. (This indicates worn linings.)

22. What must you do before disassembling an oleo strut? **Discharge the pressure.**

23. Where can you find instructions for jacking one wheel of an aircraft to change a tire? **The aircraft maintenance manual.**

Subject L - Hydraulic and Pneumatic Power Systems

1. What are the three principal categories of hydraulic fluids?
1. Mineral (5606), 2. **Polyalphaolefin** (poly alpha olefin) (83282), 3. **Phosphate ester** (Skydrol)

2. What is the color of mineral based hydraulic fluid? **Red.**

3. How do you determine which type of hydraulic fluid to use in a specific system?
The type of fluid is specified in the aircraft maintenance manual, or on the instruction plate attached to the reservoir on the unit being serviced.

4. What will happen to the seals in a vegetable base hydraulic system if it is serviced with mineral base or phosphate ester base fluids? **The seals will swell, break down, and block the system.**

5. When installing a chevron seal what must be considered? **A chevron seal is directional and must be installed with pressure going toward the open side of the seal.**

6. When hydraulic lines have been disconnected, what precautions should be taken to prevent contamination of the system? **All hydraulic lines and fittings should be capped or plugged immediately after disconnecting.**

7. What happens to the hydraulic fluid flow if the filter element becomes clogged with foreign matter?
There is a bypass valve which routes the hydraulic fluid directly from the inlet port to the outlet port.

8. What is a micronic filter? **A filter with a paper element.**

9. Name the filters used in aircraft pneumatic systems? **Paper pleated and screen type.**

10. Why are some hydraulic reservoirs pressurized? **To ensure a positive flow of fluid to the engine driven pump at high altitudes.**

11. What methods are used to pressurize hydraulic reservoirs? **Some systems use a variable displacement hydraulic pump, engine bleed air, or hydraulic system pressure acting on a small piston inside the reservoir. Another method is an aspirator or Venturi.**

12. What are the two types of accumulator housings? **Spherical, and cylindrical.**

13. Name three types of hydraulic accumulators. **The diaphragm type, bladder type, and piston type.**

14. What is the purpose of a pressure relief valve in a hydraulic system? **It is to limit the amount of pressure in the system. It is, in effect, a system safety valve.**

15. What is the purpose of an unloading valve in a closed hydraulic system?
The unloading valve is designed to provide a low-pressure path for the fluid to flow from the pump back to the reservoir when the system has no flow requirements. The unloading valve also acts as a pressure regulator.

16. What is the function of a wing flap overload valve?
The purpose of the valve is to prevent possible structural damage to the flaps or the flap system that might result from the flaps being lowered at excessive speeds.

17. What is the purpose of the shear-able section in a hydraulic pump?
In the event the pump was to seize, the shear section will disconnect the pump from the engine, allowing the engine to continue to operate.

18. What are two different types of hydraulic pumps?
There are hand pumps and power pumps. Pumps can also be classified as positive displacement, or nonpositive displacement.

19. What pump is most suitable for low-pressure pneumatic systems? **A vane-type pump.**

20. What protects a direct-pressure type hydraulic pressure gauge from pressure surges?
A dampening device in the form of a very small restrictor is installed in the line leading to the gauge, or at the inlet to the gauge itself.

21. What are pneumatic systems used for in aircraft?
Pneumatic systems are sometimes used to operate brakes, open and close doors, starting, pump driving, and operating emergency devices.

22. What happens to the air after a pneumatic system is operated? **The air is dumped overboard.**

23. Why should a pneumatic system be purged periodically? **To remove contamination, moisture, or oil from the components and lines.**

24. What is the purpose of the relief valve in a pneumatic system?
The relief valve protects the system against over-pressurization (thermal expansion) by venting excess pressure to the atmosphere.

25. What is the purpose of an accumulator? **Accumulators are used to prevent hydraulic system shock when under high load demand conditions.**

26. What would cause a hydraulic filter to go into full bypass mode allowing unfiltered fluid into the system? **A clogged filter.**

Subject M - Cabin Atmosphere Control Systems

1. What is the principal control element in a cabin pressurization system? **The cabin outflow valve.**

2. What is the purpose of the negative pressure relief valve in the pressurization system?
The negative pressure relief valve prevents accidentally obtaining a cabin altitude which is higher than the altitude of the aircraft.

3. What control changes the position of the outflow valve?
The pressurization controller, located in the cockpit is used to set the cabin air pressure to a desired altitude, normally between six and eight thousand feet.

4. What are the two groups of independent cabin compressors? **They are positive displacement, and centrifugal compressors.**

5. What method is used by turbine powered aircraft for pressurization? **Bleed air from the engine compressor is used for pressurization.**

6. What limits the degree of cabin pressurization?
The structural design features of the fuselage, and by the capacity of the superchargers to maintain a constant volume of airflow to the fuselage.

7. Where does the warm air for cabin heating come from in most small reciprocating engine aircraft?
From the shroud around the engine muffler.

8. What are three methods of supplying heat to the conditioned air when the "heat of compression" is not sufficient for this purpose? **Fuel burning combustion heaters, electric heaters, and exhaust gas air-to-air heat exchangers.**

9. What is the function of ventilating air in a combustion heater? **Ventilation air is used to carry the heat to the places where it is needed.**

10. Where does the fuel used in an aircraft combustion heater come from? **The aircraft fuel tanks.**

11. What controls the temperature in an aircraft cabin that is heated with a combustion heater? **A thermostat**

12. What are the sources for ventilation air in a combustion heater? **For air circulation and heater operation on the ground a blower is used. Inflight, ram-air inlets, or cabin compressors on pressurized aircraft.**

13. What are the components of an air cycle cooling system?
An expansion turbine (cooling system), an air-to-air heat exchanger, and various valves which control airflow through the system.

14. What causes a temperature drop in an air cycle cooling system?
As the compressed air passes through the expansion turbine, it performs the work of turning the turbine and undergoes a pressure and temperature drop.

15. What are the components in a vapor cycle (Freon) cooling system? **The compressor, condenser, receiver/dryer, expansion valve, and evaporator.**

16. How do you determine the liquid level in a vapor cycle cooling system? **Operate the system for about 5 minutes to reach a stabilized condition, and then observe the flow of Freon through the sight glass. A steady flow indicates sufficient charge. If the Freon is low, bubbles will appear in the sight glass.**

17. How is the vapor-cycle cooling system compressor lubricated? **Specialized refrigerant oil.**

18. What are the components of a continuous flow oxygen system?
Oxygen will flow continuously from a high-pressure cylinder, through a high-pressure line to the pressure regulation reducing valve. The oxygen will then flow through a calibrated orifice in the outlet, controlling the amount of oxygen delivered to the rebreathing mask.

19. What must be done if an oxygen system has been depleted and not recharged within two hours?
It must be purged with dry nitrogen or dry air and oxygen.

20. What safety considerations must be observed when filling oxygen cylinders?
Oxygen cylinders should be filled in an oil free environment. The mechanic who fills the cylinders should not have any petroleum products on their clothes, hands, or in their hair.

21. What is the main chemical agent inside of an oxygen generator?
Sodium chlorate is the main chemical agent used in aviation oxygen generators. The chemical is ignited by a spark-emitting cap, and when it burns, 02 is generated. These systems are lighter and less complex than oxygen storage-based systems. The main drawback of oxygen generators is that once the burning of the sodium chlorate begins, it cannot be stopped until the chemical is consumed.

22. How are high- and low-pressure oxygen cylinders identified?
High pressure (1800-1850 psi) oxygen cylinders are green in color and have the words "Aviator's Breathing Oxygen" stenciled lengthwise in white, one-inch letters. Low pressure (400-425 psi) cylinders are painted light yellow.

23. What are the three ways supplemental oxygen can be carried in an aircraft? **As liquid oxygen, a high-pressure gas, or a chemical candle.**

24. What is an acceptable lubricant for installing oxygen system fittings? **Teflon, or water-based lubricants.**

25. What type or grade of oxygen must be used in aircraft? **Aviators-grade breathing oxygen.**

26. What is a roots blower? **A type of engine driven compressor.**

Subject N - Aircraft Instrument Systems

1. What three flight instruments are normally operated from the pitot-static system?
The airspeed indicator is connected to the pitot and static pressure sources. The altimeter and vertical speed indicator are connected to the static pressure source only.

2. What instrument indications will result if the static pressure line becomes disconnected inside the cabin of a pressurized aircraft? **The altimeter and airspeed indications will both be lower than normal, and the vertical speed indicator will indicate a momentary decent then return to zero.**

3. Who is authorized to perform tests to calibrate an altimeter? **The manufacturer, or a certified repair station.**

4. What is required after replacement of components connected to the pitot-static system? **A leak test is required.**

5. In wet-type vacuum pumps, what are the vanes made from? **Steel.**

6. How are vanes of a wet-type pump lubricated? **Engine oil.**

7. What are the sources of power to gyroscopic instrument operation?
Gyroscopic instruments can be operated either by vacuum, electricity, or air pressure.

8. What causes an electric driven gyro rotor to tilt when the aircraft is turned? **Gyroscopic precession.**

9. What is used as a guide for range marking of aircraft instruments?
The Aircraft Specifications, or Type Certificate Data Sheets and the specific aircraft maintenance manual or flight manual.

10. Where are instrument range markings placed?
They are applied to the outer edge of the cover glass or over the calibrations on the dial face of the instrument.

11. What other type of mark is required when range markings are applied to the glass instrument cover?
An index mark, which is a white line extending from the glass cover onto the instrument case to indicate slippage of the glass. Glass slippage would cause the range markings to be in error.

12. What is a synchro-type remote indicating system?
These systems can be used to show movement and position of landing gear, wing flaps, oil cooler doors, or other movable parts of the aircraft. A synchro system is an electrical system used for transmitting information from one point to another. The three most common synchro systems are the Autosyn, the Selsyn, and the Magnesyn.

13. What type of fuel quantity system is an electric fuel measuring device that accurately determines the density weight of the fuel in the tanks of an aircraft? **The capacitor fuel type quantity system.**

14.What is meant by "swinging a compass"? **It is the adjustment of the North-South, and East-West magnets to reduce deviation, which are magnetic influences of the aircraft structure and electrical systems.**

15. When inspecting a magnetic compass, the bowl should be filled with liquid and should not contain any bubbles or discolorations. What is the purpose of the liquid in the bowl? **It is to dampen the oscillations of the float.**
16.What is the fluid used in a magnetic compass? **A clear fluid such a kerosene.**

17.Where is the compass correction card placed? **Near the compass and in plain sight of the pilot.**

18.Which instrument is used to indicate the speed of the crankshaft of a reciprocating engine and the speed of the main rotor assembly in a turbine engine? **A tachometer.**

19.What type of indicating system is used to indicate turbine engine exhaust gas temperature (EGT)?
A thermocouple system.

20.What does the manifold pressure gauge indicate when the engine is not operating? **It indicates atmospheric pressure.**

21.What is used to check a manifold pressure gauge for correct indication when the engine is not operating?
Either a barometer, or an altimeter after it has been set to zero.

22.What is the meaning of the yellow range on the airspeed indicator? **The yellow arc designates the cautionary range.**

23.What does a Mach meter indicate? **The ratio of aircraft speed to the speed of sound at a particular altitude and temperature during anytime in flight.**

24.Why do you not try to remove a blockage in a pitot system? **To prevent further damage to the pitot system.**

Subject O - Communication and Navigation Systems

1. Name the basic components of a communication system. **They are the microphone, transmitter, transmitting antenna, receiving antenna, receiver, and headset or loudspeaker.**

2. What is the most common communication system in use today? **It is the VHF (very high frequency) system.**

3. Which radio system is used for long range communication? **The HF (high frequency) system.**

4. What is a transceiver? **It is a self-contained transmitter and receiver which share the same power supply, antenna, and tuning device.**

5. What type of conductor is used for transmitting information between antennas and receiver/transmitters? **Coaxial cable.**

6. Describe a BNC type connector. **It is a connector used with coaxial cables that takes one quarter turn to fully seat.**

7. What are the components of a typical VOR (Very High Frequency Omni-range Navigation equipment) system? **A receiver, visual indicator, dipole antenna, and power supply.**

8. What are the basic components of an autopilot system? **The gyros, servos, and amplifier.**

9. What are the sensing elements of an autopilot system? **The directional gyro, turn-and-bank gyro, attitude gyro, and altitude control are the sensing elements. These units' sense aircraft pitch, roll, and yaw to automatically generate signals to keep these movements under control.**

10. What are the output elements of an autopilot system? **The output elements of an autopilot system are the servos which actuate the control surfaces.**

11. What are three types of servos used in autopilot system? **Hydraulic, pneumatic, and electric.**

12. What is the purpose of a bonding jumper/wire on a radio shock mount? **To provide a low-impedance ground return and minimize radio interference from static electricity.**

13. What is the frequency of an emergency locator transmitter (ELT)? **It is 121.5, 243.0, and 406.0 MHz (121.5 *times 2 equals 243)***

14. How can you determine when the batteries of an ELT should be replaced? **The useful life of the batteries is determined by the battery manufacturer, and the battery replacement date must be marked on the outside of the transmitter. Time is computed from the date of manufacture of the battery.**

15. Describe the proper method of routing coaxial cable from the antenna to the receiver. **When installing coaxial cables, secure them firmly along their entire length at intervals of approximately two feet. To assure optimum operation, coaxial cables should not be routed or tied to other wire bundles and be as short as possible. When bending coaxial cable, be sure that the bend is at least 10 times the size of the cable diameter.**

16. Where is the preferred location for mounting a VOR antenna on the small aircraft?
The VOR antenna is "V" shaped. The preferred location is on top of the forward part of the cabin with the apex of the "V" toward the front. An acceptable alternate location is on top of the vertical stabilizer.

17.Where should antennas be located? **They should be mounted on the lower surface of the aircraft in a position that will not be blanketed by the wings when the aircraft is banked.**

18. Why are doublers required to be installed under aircraft skin when an antenna is mounted on the aircraft skin? **To prevent cracking in the skin.**

19.What are marker beacons? **It is part of the ILS system and is used to indicate the aircraft position on the approach to the runway.**

20.What is the indication of the middle marker beacon? **It is an amber light and an audible tone.**

21.What is an ADF? **An automatic direction finder.**

22.What does DME stand for? **Distance measuring equipment.**

23. What two parts make up the ILS system? **Localizer and glideslope.**

24. Explain how to determine the pressure altitude to an airfield and hot to set it in the altimeter. **You can listen to the ATC or tune in the Automatic Terminal Information Service (ATIS), and they will announce the barometric pressure altitude. You will then dial in that setting on the altimeter in the Kollsman window. Also, you can dial in the known field elevation and the altimeter will reflect the barometric pressure.**

Subject P - Aircraft Fuel Systems

1. What is the purpose of a fuel dump system?
It is an emergency system provided so that the flight crew can quickly bring the weight of the airplane down to the maximum landing weight if an emergency occurs during or shortly after takeoff.

2. Other than reducing weight, what other function can be accomplished with a fuel jettisoning system?
Fuel can be dumped from the heavy wing to maintain lateral stability. A fuel dump system is required for all transport airplanes if the maximum takeoff weight is more than 105% of the maximum landing weight. The airplane must be free of fire hazards during dumping, and fuel must dump free and clear of the airplane.

3. What are a few types of fuel cells? **Bladder-type fuel cells, integral fuel cells, integral fuel tanks, and welded or riveted fuel tanks.**

4. How is the weight of a bladder-type cell supported? **The bladder-type cell depends on the structure of the cavity in which it sits to support the weight of the fuel within it and maintains the shape of a cell. They are made of either rubber or nylon impregnated with neoprene.**

5. What is "wet-wing" construction?
Wet wing construction is when the fuel cells are built into the wings of the aircraft structure using the skin to contain the fuel. They are known as integral fuel cells.

6. What markings must be placed near the fuel filler opening on reciprocating engine aircraft?
The word "Avgas" and the minimum fuel grade.

7. What are the advantages of a single point pressure fueling system and what is it sometimes called?
Pressure fueling, sometimes referred to as *single-point* or underwing fueling, and *greatly reduces the time required to service large aircraft*. It also eliminates aircraft skin damage from hoses and hose nozzles *and reduces the chance of fuel contamination.*

8. After fueling an aircraft, why is it important for a technician to wait at least 30 minutes prior to taking a fuel sample?
Fueling aircraft causes turbulence in the tanks, which results in contaminants such as water and solid particles to mix with the fuel. It is important for the technician to allow enough time for water and *contamination to settle into the sumps* prior to pulling a fuel sample.

9. Why should the fuel sumps of aircraft be drained before the first flight of the day?
To remove any water that has condensed in the fuel and collected in the sump.

10. What does water look like when in fuel that has been drained from the sumps? **It looks like clear balls of jelly.**

11. What is the purpose of a fuel temperature indicator on a turbine engine?
It is a means for checking the temperature of the fuel in the tanks at the engine to determine when there may be a danger of ice crystals forming in the fuel.

12. What is the purpose of warning lights in connection with fuel system?
Warning lights may be used to indicate when the fuel pressure is too low, or to indicate when the fuel quantity in a tank is below a certain amount.

13. Where are electrically operated valve-in-transit indicator lights used?
On large multiengine aircraft, each of the fuel cross feed and line valves may be provided with valve in-transit indicator lights. The light is on only during the time the valve is in motion and is off when movement is complete.

14. Why do fuel selectors have detents? **To "lock" the switch into the selected position and so the operator can feel when the switch is in a specific position.**

15. What are four general types of fuel quantity gauges?
The four types are sight glass (visual), mechanical (linkage), electrical (transmitter, receiver), and electronic (totalizer).

16. Which type of fuel quantity gauge is more accurate than the other types?
The electronic-capacitance type because it measures by weight.

17. Describe the sensor used in an electronic type fuel quantity indicating system?
It is a tubular capacitor that extends across the tank from top to bottom.

18. What is a drip gauge?
An under-wing bayonet type fuel gauge that consists of a calibrated hollow drip tube that is drawn out from the lower wing surface. When the top of the tube reaches the level of the fuel, the tube will begin to drip indicating fuel level.

19. What is a cross-feed system?
An interconnected fuel system designed so that fuel can be fed from any tank to any engine.

20. What is the purpose of the baffles in a fuel tank?
To prevent the fuel from surging because of changes in attitude of the aircraft.

21. How can a fuel tank be checked for leaks after a repair?
By a pressure check using air pressure not over one-half psi with liquid soap or bubble solution to identify the leak.

22. What is another name for a pressure type refueling system? **Single point refueling system.**

23. What is the purpose of a jettisoning system on a small aircraft? **To obtain a safe landing weight.**

Subject Q - Aircraft Electrical Systems

1. What is the purpose of a circuit breaker? **To protect the circuits and wires from fire. The circuit breaker opens the circuit when an overload exists.**

2. What are the two principles on which circuit breakers operate? **Thermal and magnetic.**

3. What tool is used to measure the size of unmarked electrical wire? **A wire gauge can be used to measure wires ranging in size from number zero to number 36.**

4. What are the colors of aircraft position lights and where are they mounted?
A green light is mounted on the right wingtip, a red light on the left wingtip, and a white light mounted in a position where it is visible from the rear of the aircraft.

5. What are the factors to be considered when selecting wire size for electrical power?
One factor is the allowable power loss in the line. A second factor is the permissible voltage drop in the line, and a third factor is the current-carrying ability of the conductor.

6. When is a circuit breaker or fuse designed to open the circuit? **A circuit breaker or fuse should open the circuit before the conductor emits smoke. To accomplish this, the current characteristics of the protective devise must fall below that of the associated conductor.**

7. What type of breakers are not acceptable for use in aircraft? **Auto-reset breakers.**

8. What is a slow-blow fuse? **A fuse that compensates for surges and high inrush current by not blowing for several milliseconds.**

9. What are the three most common faults that occur in an electrical circuit?
They are *open circuits*, in which wires are broken, *shorted circuits*, in which ground leads cause current to be returned by shortcuts to the source of power; and in circuits causing lights to burn dimly and relays to chatter.

10. What size electrical conduit should be used for a specific cable bundle?
To allow for ease of maintenance and possible future circuit expansion, the conduit should have an inside diameter that is 25% larger than the maximum diameter of the conductor bundle.

11. What color insulator on a solderless connector is proper for a 10-gauge wire? **Yellow.**

12. How should electrical switches typically be oriented in the on position? **Up or forward.**

13. When should electrical switches be de-rated from their normal current rating?
For high rush-in circuits such as circuits containing incandescent lamps (landing lights), and inductive circuits that have magnetic energy stored in solenoid coils, or relays, and for DC motor circuits, which draw several times their rated current during starting.

14. When do DC electric motors draw several times their rated current? **During starting.**

15. What would cause an AC electrical motor to run too fast? **An excessive supply of voltage, or the motor field windings shorted.**

16. What would cause an AC electrical motor to run too slow? **Low applied voltage, defective wiring, or no lubrication.**

17. How is the output voltage of an alternator controlled? **By using a voltage regulator to control the exciter field current and thus regulate the exciter output voltage applied to the alternator field.**

18. What should be checked before any aircraft electrical load is increased?
The associated wires, conductors, and circuit protection devices should be checked to determine that the new load will not exceed the rated limits of these units.

19. What is the main advantage of using AC for aircraft electrical power systems?
The principal advantage is that the voltage of AC power systems is easily changed using transformers. Therefore, you can transmit power at high voltage and low current, thus reducing the size and weight of the wiring in the circuit.

20. In AC power systems, how is DC obtained for battery charging? **The alternating current is changed to direct current using rectifiers.**

21. What warns pilots of overheating batteries? **A thermal sensor in the battery and a light in the cockpit.**

22. How long should bonding jumper wires be made? **Large enough to handle all the return current flow and as short as possible to prevent an increase in resistance.**

23. What are the two items that wear on a starter generator? **Commutator and the brushes.**

24. What powers the ELT? **The ELT battery.**

25. What is the purpose of a static wick? **It dissipates static energy from the aircraft to avoid damaging electrical components.**

Subject R - Position and Warning Systems

1. What is the purpose of the anti-skid system? **To bring the airplane to a stop without skidding by providing the most effective braking power under all types of runway conditions.**

2. What does the anti-skid warning light indicate? **The anti-skid warning light indicates that the system is turned off or there is a system failure.**

3. What type of warning devices are usually provided for retractable landing gear? **A red light and aural device.**

4. When does the landing gear warning horn operate in a landing gear warning system?
When the throttles are retarded, and the landing gear is in any position other than down and locked.

5. What type of position indicators are normally used to indicate that the landing gear is down and locked?
Normally there is a green light for each gear.

6. Which positions of retractable landing gear normally have a position indicator? **The up and locked position, down and locked position, and in transit.**

7. What is a squat, or weight on wheels switch, and where is it located? **It is a switch that detects if the aircraft is on the ground. They will be in the torsion links of the main landing gear and prevents accidental retraction of the gear while the aircraft is on the ground.**

8. What device is used as a sensor to detect the condition of a retractable landing gear?
A microswitch. (Commonly called squat switch or weight on wheels switch.)

9. When should you check landing gear switches, lights, warning horn, or buzzer for proper operation?
During a landing gear retraction check or swinging the landing gear.

10. How does a takeoff warning horn differ from a landing gear warning horn?
The takeoff horn is intermittent, whereas the landing gear warning is continuous.

11.What items may cause a takeoff warning horn to operate in a typical transport jet aircraft?
If the throttles are advanced and any of the following conditions exist, the takeoff warning horn will sound.

1. Speed brakes not down.
2. Auxiliary power exhaust door open.
3. Flaps not in takeoff range.
4. Stabilizer not in the takeoff setting.

12.What is the master caution light? **It is a light that *alerts the pilot that there is an abnormal or change in condition* with one of the aircraft systems.**

13. What is used to indicate the position of wing flaps? **A resistance-type remote indicating system.**

14. What are the positions of aircraft navigation lights? ***Red left wing / Green right wing / White tail***
Remember ***"REDS NOT RIGHT"***

Subject S - Ice and Rain Control Systems

1. Describe the operating principle of inflatable deicer boots.
Pneumatic deicing systems use rubber inflatable boots attached to the leading edge of the wings and stabilizers. During operation, the tubes are inflated with pressurized air and deflated in an alternating cycle. This inflation and deflation causes the ice to break off and it is carried away by the air stream. Both wings inflate and deflate at the same time.

2. Why is critical to prevent the formation of ice on aircraft wings and control surfaces?
Ice formation distorts the shape of the wing and air flowing over it, reducing aerodynamic lift. Also, ice weighs the aircraft down, adding stress to the airframe.

3. What are two methods of inflating pneumatic deicer boots?
Pressurized air is provided by an engine driven air pump (vacuum pump), or by bleed air from the turbine engine compressor.

4. What methods are used to attach deicer boots to the leading edges of wing and tail surfaces?
They are attached by bonding to the surface with cement, fairing strips and screws, or a combination of both methods.

5. What is the purpose of an air-oil separator in a pneumatic deicing system?
The purpose of *removing the oil* from the air of the deicing system is to *prevent deterioration* of the rubber *deicing boots*, caused by contact with the oil.

6. What is used to clean deicer boots? **A mild soap and water solution.**

7. What must be done before you can make a cold patch repair to a deicer boot?
Clean, rough the surface of the boot and patch, glue and attach.

8. What component of a pneumatic deicer system normally allows suction to be supplied to the boots to hold them down in flight? **The solenoid distributor valve.**

9. Describe the operating principle for thermal anti-icing systems? **Thermal anti-icing systems are used primarily for the purpose of preventing ice from forming on the leading edges. However, they are designed to also deice the leading edges by supplying much hotter than normal air for short periods on a cyclic system. The airfoils that are to be protected are usually provided with closely spaced double skin. The *hot air is passed through the space between skins, and the heat is sufficient to prevent formation of ice or to melt any ice next to the skin.* The heated air is supplied continuously if the anti-icing system is turned on. Once used, this heated air is vented overboard through a hole in the leading edge.**

10. How can you determine if the heater in a pitot is working? **Turn it on and feel for heat coming from it.**

11. What methods are used to supply heated air for thermal anti-icing systems?
Bleed air from the turbine engine compressor, engine exhaust heat exchangers, and ram air heated by a combustion heater.

12. How is overheating prevented in a thermal anti-icing system using bleed air?
A thermal switch will cause a shut-off valve to close and stop the flow of bleed air when the temperature of the leading edge reaches approximately 185°F. When the temperature drops, the valve opens and hot bleed air enters the wing once again.

13. What is the purpose of the de-ice boot electrical timers? **To inflate the boots symmetrically. Or, in the case of an electrical system, to cycle each boot individually preventing an excessive load on the electrical system.**

14. In a thermal anti-icing system, what happens to the air after it has heated the leading edge of the wing?
The air is exhausted to the atmosphere at the wingtip or at points where ice formation could be critical.

15. What problems are associated with electrically heated windshields? **Delamination, arcing, scratches, and discoloration.**

16.. What is windshield delamination? **Delamination is the separation of the plies.**

17. What does arcing usually indicate in an electrically heated windshield? **Arcing usually indicates that there is a breakdown in the conductive coating.**

18. Name the three methods of removing rain from aircraft windshields. **Wipers, pneumatic systems, and chemical repellant.**

19. What type of power is used to operate windshield wiper systems? **Electrical or hydraulic power.**

20. What are common problems encountered with windshield wipers? **One problem is the tendency of the aerodynamic forces to reduce the wiper blade loading pressure on the windshield which causes ineffective wiping or streaking. Another problem is achieving fast enough wiper oscillation.**

21. How does a pneumatic rain removal system work? **This method uses high air pressure. The high temperature engine compressor bleed air is blown across the windshields, this air blast forms a barrier that prevents raindrops from striking the windshield surface.**

22. Why should your windshield wipers not be operated when the windshield wipers are dry? **This can scratch the glass.**

Subject T- Fire Protection Systems

1. In what area of an aircraft would you find carbon monoxide detectors?
CO detectors are commonly used to check for the presence of carbon monoxide gas in aircraft cabins and cockpits. They are placed where they are easily visible.

2. What color does a CO detector change to when carbon monoxide fumes are present?
A reliable CO detector is an indicator tube or packet which contains yellow silica that is impregnated with a silicomolybdate compound. When air containing carbon monoxide is drawn through the tube or packet, the silica gel turns a *shade of green*. Other types change from a tan color to *gray or black.*

3. What are two types of smoke detectors? **Photoelectric and visual.**

4. Where are smoke detectors used in the aircraft? **They are commonly used in cargo and *baggage compartments, and the lavatory.***

5. How are thermal switches wired in thermal switch fire detection systems?
The switches are wired in *parallel with each other*, but in *series with the warning lights.*

6. Describe the operating principle of a thermal switch fire detection system.
The thermal switch system consists of one or more lights, which are energized by aircraft power when connected to the circuit by a thermal switch. The thermal switches are heat sensitive units that complete the circuit at a certain temperature.

7. Describe the operating principle of a continuous loop fire detection system.
The continuous loop detector consists of one or more wires, imbedded in a special ceramic core inside of a conductive tube. In case of fire or an overheat condition, the ceramic core's resistance drops, allowing current to flow between the signal wire and the conductive tube, lighting a warning light.

8. How does a thermocouple fire detection system differ from the thermal switch system?
A thermocouple depends upon the rate of temperature rise and will not give a warning when the engine overheats slowly or a short circuit develops.

9. What are two types of fire extinguishing systems? **The *high rate of discharge (HRD) system uses Halon* as an agent and is effective on all fire classes. *Conventional fire systems use carbon dioxide* and are effective on class B and C fires.**

10. What type extinguishing agent is usually found in a HRD system? **The extinguishing agent is usually one of the halogenated hydrocarbons (Halons) boosted by high pressure dry nitrogen. Halon 1301 is the most common and sometimes referred to as Freon 13.**

11. What type extinguishing agent is usually associated with a conventional type extinguishing system?
This system usually contains CO2 but may use any other adequate agent.

12. What is the purpose of the yellow disk in a CO2 fire extinguishing system?
It is the system discharge indicator disk, and it indicates which bank of bottles has been emptied through normal discharge.

13. How can you determine the charge of a CO2 extinguisher? **By weighing it.**

14. In a turbine engine Freon (Halon) fire extinguishing system, how are bottles discharged? **By an explosive discharge cartridge (Squib) which is detonated electrically, breaking a frangible disk.**

15. How is a Freon fire extinguishing system protected from temperature rises more than set limits?
The system is equipped with a thermal fuse that will melt at high temperature conditions and will blow the red discharge indicator disk.

16. How does ambient temperature affect the pressure reading on a fire extinguisher?
Low temperatures will decrease the absolute pressure, and high temperatures increase the absolute pressure.

17. What type of extinguisher is recommended for brake fires? **A dry-powder extinguisher.**

18. How can you determine the service life of a fire extinguisher discharge cartridge?
By the manufacturer's date stamped on the face of the cartridge. The service life of the cartridge is usually recommended in terms of hours below a predetermined temperature.

19. What type of hand-held fire extinguishers are available for extinguishing interior aircraft fires?
The three most common type hand fire extinguishers for a Class A fire are water, carbon dioxide (CO2), and dry chemical extinguishing agents.

20. What type of fire detection system gives a more complete coverage of a fire hazard?
A continuous-loop detector system.

21. Name the different class of fires.
Class A is solid combustible materials. Class B is combustible liquids. Class C is electrical. Class D is metal, such as magnesium.
A = Ashes
B = Boil
C = Circuit
D = Death Metal

22. How does a photoelectric smoke detector work?
The smoke particulates block the photoelectric receptor from sensing light.

23. How would you determine when the next hydrostatic test is due on a portable fire bottle? **Look at the label for the DOT information to determine when the next test is due. It will be five years from the last test date.**

Section IV – Powerplant Theory and Maintenance

Oral Questions

Section IV – Powerplant Theory and Maintenance (3 Subjects)		
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Turbine Engines	Subject B	74
Engine Inspection	Subject C	76
(FAA Reserved)	Subjects D, E, F, G	N/A

Subject A - Reciprocating Engines

1. How are conventional reciprocating engines classified?
They are classified according to cylinder arrangement with respect to the crankshaft (in-line, vtype, radial, and opposed), or according to method of cooling (liquid cooled, or air cooled).

2. What are the different types of piston rings? **Compression rings, Oil control rings, and Scraper rings.**

3. What are the main causes of a cylinder having low compression? **Broken piston rings, rings that are not seating properly, burnt valves, and poorly seating valves.**

4. What is the purpose of the oil control rings? **They are used to control the thickness of the oil film on the cylinder walls.**

5. What may be the result of installing piston rings incorrectly? **Excessive oil consumption.**

6. What type of piston rods are commonly found in radial engines? **A master and articulating rod assembly.**

7. What type of bearings are in general use in reciprocating engines? ***Plain, roller, and ball bearings.* Plain bearings are generally used for crankshaft, camshafts, and connecting rods. Roller bearings are used primarily as crankshaft main bearings. And ball bearings are used for supercharger impeller shaft bearings and crankshaft thrust bearings on large radial engines.**

8. What is the indication of valve blow-by? **Valve blow-by is indicated by a hissing or whistle when pulling the propeller through by hand. A cylinder compression check should be completed to identify the faulty cylinder.**

9. What is the purpose of using more than one spring for valve closing?
Valve springs will resonate (or surge) at certain engine speeds. If only one spring is used, the valve will float as the spring surges. To eliminate this problem, two springs (one inside the other) are installed on each valve. Each spring will resonate at a different engine speed, eliminating valve float.

10. What is the purpose of valve overlap? **Valve overlap permits *better volumetric efficiency* and *lowers the cylinder operating temperatures*.**

11. Describe the inspection you would give the valve springs during engine overhaul.
They should be cleaned thoroughly, then visually inspected for evidence of overheating, cracks, broken ends, and compression strength.

12. What is the purpose of using valves with sodium filled stems?
Some intake and exhaust valve stems are hollow and partially filled with metallic sodium. Sodium is used because it is an *excellent heat conductor*. The *sodium melts* at a relatively low temperature, and as the valve moves up and down the *sodium is circulated*, *carrying the heat from the valve head to the stem*. Then the heat is dissipated to the cylinder head.

13. What causes engine sudden stoppage? **Striking an object or engine seizure due to internal damage.**

14. What type of inspection must be made after sudden stoppage of an engine? **Most manufacturers require a complete engine tear down and inspection.**

15. What is the purpose of the crankshaft dynamic dampers used in aircraft engines?
Dampers are used to overcome forces which cause deflection of the crankshaft and torsional vibration. These forces are generated by the power impulses of the pistons. Crankshaft vibrations are reduced by placing floating dampers (weights) in the counterweight assembly, particularly in a single throw type crankshaft.

16. How would you make a "runout" check on a crankshaft that is still installed in the engine?
Remove the propeller from the crankshaft and attach a dial indicator gauge to the front of the crankcase. Adjust the position of the gauge needle so that it is touching the shaft. Rotate the crankshaft and check for misalignment. Refer to the table of limits to check the allowance. Flanged crankshafts must also be checked from the front face of the flange.

17. What is detonation?
Normal combustion is when the fuel-air mixture burns at a uniform rate across the combustion chamber. The temperature and pressure within the cylinder rise at a normal rate as the mixture burns. All fuels have critical limits of temperature and compression, beyond this limit they will ignite spontaneously and burn with explosive violence. This instantaneous explosive burning of the last portion of the charge is called detonation.

18. What cylinder is engine to magneto timing based on?
The number one cylinder. Timing is usually set for around 30 degrees before top dead center of the compression stroke.

19. What is engine sudden speed reduction?
This occurs when the propeller strikes an object but continues to run. When this occurs, a thorough external engine inspection should be carried out, including an oil analysis. The propeller should also be inspected along with a run-out check.

20. What can be learned about the condition of an engine by studying the results of a compression check?
From the cylinder compression check you can determine if the valves, piston rings, and pistons are adequately sealing the combustion chamber.

21. How can a cold cylinder be located on a double row radial engine? **Either an old tool called a magic wand or a more modern infrared laser thermometer.**

22. What instrument can be used to check bore for out of roundness?
A cylinder bore can be checked with a dial indicator, telescopic gauge, and outside micrometer, or inside micrometer.

23. What would a cold cylinder indicate? **That there has been no combustion inside the cylinder, normally due to no ignition or a clogged fuel nozzle.**

24. Where is a crack most likely to occur on a piston? **A crack is most likely to occur where the piston pin/wrist pin connects. The metal is thinnest at this location.**

25. What should be done to a nose wheel airplane before removing the engine?
Support the tail of the airplane.

26. What is the running valve clearance on engines equipped with hydraulic lifters? **Zero**

Subject B - Turbine Engines

1. What are the major components of a typical gas turbine engine? **A typical gas turbine engine consists of an air inlet, compression section, combustion section, turbine section, exhaust section, and accessory section.**

2. What are the two principal types of compressors used in turbojet aircraft? **The two most common compressors in use today are the *centrifugal flow and axial flow types.***

3. What are the four combustion chamber systems? **They are the can, can-annular, annular, and reverse flow annular types.**

4. What is the purpose of the interconnector tubes between can type combustion chambers?
To spread the flame to the combustion chambers that are not equipped with igniter plugs during engine starting.

5. What prevents burning of the liner walls in can type combustion chambers?
Louvers are provided along the axial length of the liners to direct a cooling layer of air along the inside wall of the liner.

6. What types of damage may be found when inspecting compressor blades?
Dents, scratches, gouges, galling, burns, burrs, pitting, and cracks.

7. What is the location and function of the diffuser section in a turbine engine?
The diffuser is the divergent section of the engine located between the compressor section and burner cans. Its function is to change the high velocity compressor discharge air to static pressure.

8. Where are stress rupture cracks most likely to occur on turbine blades?
They usually appear as small hairline cracks on or across the leading or trailing edge of the blades. The cracks appear at right angles to the edge length.

9. How are compressor blades attached to a disk-type rotor?
The compressor blades are fitted into the disks by either bulb-type, fir-tree, or dove tail type roots. The blades are then locked by means of screws, peening, locking wires, pins, or keys.

10. What is the purpose of the nozzle diaphragm, or turbine nozzle?
The turbine nozzle prepares the combustion mass airflow to drive the turbine rotor. First, they change a portion of the heat and pressure energy to velocity energy. The fixed vanes are shaped and set at such an angle that they form several small nozzles that discharge the gases at extremely high speeds. The second purpose of the turbine nozzle is to deflect the gases so they strike the turbine at the most efficient angle for maximum turbine rotation.

11. What is the major difference between turboprop and turbojet engines?
A turboprop engine usually has more turbine stages than the turbojet engine. In addition to operating the compressor and accessories, the turboprop turbine must also drive a propeller.

12. What is a turbofan engine? **A turbofan engine is in principle, the same as a turboprop, except that the propeller is replaced by a duct-enclosed axial flow fan.**

13. What is the effect of air density on the thrust of a turbine engine?
Air density determines the mass of air that is used by a jet engine. The factors that affect density are the temperature and pressure of the air. If density increases, thrust increases, and vice versa. An increase in air temperature entering an engine will cause a decrease in air density and thrust. An increase in air pressure entering the engine will cause an increase in air density and thrust. With a given throttle setting, engine thrust will vary if the temperature or pressure of the air entering the engine changes.

14. What are the two most common types of thrust reversers? **They are mechanical blockage type and aerodynamic blockage type.**

15. What is a split compressor system in a turbine engine?
The split compressor system requires two concentric shafts joining the turbine stages to their respective compressors.

16. What is one method of relieving thermal stress on a turbine disk? **One method is to direct cooling bleed air back onto the face of the disk.**

17. What may be the indications if a turbojet engine is out of trim?
The engine has high exhaust gas temperature (EGT at a target engine pressure ratio (EPR) for takeoff.

18. What is a free turbine? **A turbine wheel that, rather than driving the compressor rotor, drives a propeller or helicopter transmission.**

19. What is the main purpose of thrust reversers?
For slowing the aircraft down to effective braking speeds.

Subject C - Engine Inspection

1. What steps must be taken to prepare an aircraft for a 100-hour inspection?
Remove or open all necessary inspection plates, access doors, fairing and cowling. Then thoroughly clean then aircraft and the engine.

2. What may be used as a guide for a 100-hour inspection on aircraft engines? **FAR Part 43, Appendix D.**
3. What additional inspection must be performed if the cylinder compression is weak?
You must make an internal cylinder inspection for improper internal tolerances.

4. Where are the aircraft engine operating limitations found?
In the Aircraft Specifications or Type Certificate Data Sheet.

5. Where can a mechanic look to identify an aircraft engine?
On the engine identification plate that is affixed to the engine in an accessible location.

6. What publication is needed to inspect an engine for conformity with specifications?
The Engine Specifications or Type Certificate Data Sheet.

7. What type of FAA approval is required when a change to an engine design is not enough to require a new Type certificate? **A Supplemental Type Certificate is required.**

8. What type of FAA approval is required when a change is made to the engine principle of operation?
A new Type Certificate must be obtained.

9. What instrument used for internal inspections has been a mainstay of engine inspections for many years?
The Borescope is a precision optical instrument used for remote visual inspections of internal inaccessible areas.

10. What additional inspection should you perform if you find a cylinder has weak compression? **Cylinder leak-down test.**

11. How does an oil analysis program help to evaluate the internal condition of an engine? **oil analysis is system that establishes a trend to measure engine health. One test does not do much unless something is very wrong.**

Section V – Powerplant Systems and Components

Oral Questions

Section V – Powerplant Systems and Components (12 Subjects)		
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Subject H - Engine Instrument Systems

1. What are the units in an engine fuel flow system? **The system consists of a transmitter and an indicator for each engine.**

2. Where is the fuel flow transmitter located? **It is mounted in the fuel line between the engine driven pump and the carburetor.**

3. What type of readout is indicated on a fuel flow system? **The indicator is calibrated to record the fuel flow in pounds per hour.**

4. What exactly does a mass fuel flow transmitter measure? **The density mass of the fuel that flows through it.**

5. What is the reason for monitoring the fuel flow?
In addition to fuel consumption, the operator can determine from the fuel flow indication whether the engine is operating at the correct fuel-air mixture for a given power setting.

6. What does a manifold pressure gauge indicate? **It measures absolute pressure in the intake manifold.**

7. What would be the effect of a broken manifold pressure gauge line?
A broken line will cause the gauge to indicate atmospheric pressure.

8. What does the engine tachometer indicate? **It indicates crankshaft speed (RPM).**

9. What is the most likely cause of an oscillating tachometer? **A kink in the cable.**

10. What type of tachometer is used in multi-engine airplanes? **Alternating current tachometer generators.**

11. What are turbine engine tachometers designed to indicate? **They are designed to indicated percent of engine rotor (shaft) RPM.**

12. What is the EPR on a turbine engine? **It is a *ratio between* total *turbine discharge pressure* *to total inlet pressure* and is an indication of the thrust being developed by the engine.**

13. What is the electric source for a cylinder head temperature gauge? **A thermocouple attached to the cylinder head.**

14. Where is a carburetor air temperature bulb located? **It is in the air intake passage to the engine.**

15. How can a turbine engine EGT be checked without operating the engine?
By checking resistance to thermocouples and circuits.

16. What is the typical acceptable resistance of a cylinder head thermocouple cable? **2 to 8 ohms.**

Subject I - Engine Fire Protection Systems

1. What are the main categories of engine fire protection systems? **Spot-detection, continuous-loop, and flame detectors.**

2. Name examples of spot-detection type systems. **Thermal switch and thermocouple.**

3. Name examples of continuous-loop detection systems. **Fenwal (one "L" one wire), Kidde (two "Ds" two wires), and pneumatic.**

4. When using a thermocouple type fire detector system, what happens if the engine overheats slowly? **A thermocouple depends on the rate of temperature rise, and will not give a warning if the engine slowly overheats or a short circuit develops.**

5. How many thermocouples are required for engine fire detection? **The number of thermocouples used in an engine fire detection system depend on the size of the fire zone and the total circuit resistance.**

6. Describe the operation of a Kidde continuous loop fire detector system. **The Kidde continuous loop system has two wires imbedded in a special ceramic core within an Inconel tube. One wire acts as an internal ground and the other wire is a hot lead that provides a current. When the ceramic core material heats up its resistance drops, completing a circuit between the internal wires, lighting a light.**

7. Where does a thermocouple fire detector system get its electrical power to operate? **The thermocouple produces power to close a relay, and power from the aircraft electrical system flows through the relay to the warning light.**

8. Describe a thermal switch fire detector system? **Thermal switch systems have one or more lights that are energized by the aircraft's electrical system when a heat sensitive thermal switch closes the circuit at a specific temperature.**

9. How are thermal switches electrically connected in the circuit? **The thermal switches are connected in parallel with each other but in series with the warning light. A temperature rise in any one section of the circuit will cause a thermal switch to close and complete the circuit to indicate a fire or overheat condition.**

10. What is the most common cause of a false fire warning in a continuous loop detector system? **The common causes of false warnings are dents, kinks, or crushed sensing elements. This damage causes the internal wire too short to the ground wire or outer tubing.**

11. Will a continuous loop fire detector still indicate the presence of a fire if the element is broken in two? **Yes.**

12. What two methods are used to discharge fire extinguishing agents? **Mechanical and electrical.**

13. What method is used to release the fire extinguishing agent in a typical turbine engine fire protection system? **One common method is to equip the fire extinguishing containers with discharge valves that are operated by electrically discharged cartridges. The discharge plug is seated with a breakable disk that is ruptured by the explosive cartridge (squibs). The contents of the bottle are discharged into the engine area.**

14. What method is used to determine proper fire extinguisher container pressure?
Check the container gauge to determine if the pressure is between the prescribed minimum and maximum limits.

15. What is the color marking used to identify fire extinguishing lines?
A brown tag with a row of black diamonds.

16. What method other than the pressure gauge is used to indicate low agent pressure in a container?
Some aircraft are equipped with a low-pressure warning light in the cockpit.

17. What is the purpose of the yellow and red discharge plugs (disks) in a turbine engine fire extinguishing system?
The yellow plug indicates a pilot-initiated discharge. The red plug (disk) indicates thermal activated discharge.

18. What are two methods commonly used to distribute the fire extinguishing agent to the engine?
A perforated tube or discharge nozzles are used to distribute the agent.

19. How does the fire extinguishing agent put out the fire? **It dilutes the atmosphere so that it will not support combustion.**

20. What does "HRD' stand for? **High rate of discharge.**

21. How is the fire extinguishing agent distributed from a HRD system? **It is delivered from open-end tubes.**

22. How long does it take to discharge the extinguishing agent in a HRD system? **It only takes 1 to 2 seconds.**

23. Which type of fire detection system gives a more complete coverage to a fire hazard? **A continuous-loop system.**

Subject J - Engine Electrical Systems

1. How would you seat newly installed generator brushes to the commutator?
When new brushes are installed in a generator the face of the brushes must be shaped to provide and area of maximum contact with the commutator. To seat the brushes, use fine grain sandpaper placed around the commutator with the sanding surface facing outward. Turn the armature in a normal direction of rotation until the face of the brushes is properly contoured. Remove the sandpaper and blow out any residue with compressed air.

10 Steps

1. ***Remove Cover***
2. ***Remove Brushes***
3. ***Install Sandpaper***
4. ***Install new brushes***
5. ***Rotate Generator***
6. ***Remove Brushes***
7. ***Remove Sandpaper***
8. ***Blow out Generator***
9. ***Install New Brushes***
10. ***Install Cover***

2. When is it necessary to replace the brushes in a starter? **Once they reach half their original length.**

3. Where is the generator rating and performance data located? **On the data plate attached to the generator.**

4. What units make up a DC generator three-unit regulator? **The voltage regulator, current limiter, and reverse current cutout.**

5. What method is used to control the voltage of an aircraft alternator? **The voltage regulator.**

6. What determines the frequency of the voltage of an alternator? **The frequency depends upon the speed of rotation of the rotor and the number of poles.**

7. How is alternator frequency maintained? **By installing a constant speed drive (CSD) unit between the engine and the alternator.**

8. What are the three basic types of DC motors? **Series motors, shunt motors, and compound motors.**

9. Name the parts of a DC motor? **The armature, brushes, commutator, and field frame (ABC-F).**

10. Why is a starter-generator system, used on many turbine engines?
To save space and weight. The starter-generator operates as a starter motor during engine starting. After the engine has reached a self-sustaining speed, it switches operation to a generator for supplying AC electrical power for aircraft systems.

11. Why should stranded wire be used in powerplant applications? **It is less likely to fatigue and break from vibrations.**

12. What is the American Wire Gauge (AWG) system of designating electrical wire size?
A gauge number is assigned to the wire according to its cross-sectional area. The smaller the gauge number the larger the wire.

13. What is open wiring? (Not an open circuit) **Any wire, wire group, or wire bundle not enclosed in conduit.**

14. What methods are used to control the voltage output of DC aircraft generator?
The *vibrating type voltage regulator, three-unit regulator, and carbon-pile.* The only practical means of regulating generator voltage is to control the strength of the magnetic field. Field strength is determined by the amount of current flowing through the field coils, and the current is controlled by placing some form of variable or intermittent resistance in the external field circuit of the generator.

15. What aircraft electrical system normally doesn't have a fuse or circuit breaker? **Starter circuit.**

16. Why are protective covers placed on some electrical switches? **To prevent the switch from accidentally being actuated.**

17. What are the causes of excessive arcing at the generator brushes? **Arcing can be caused by a commutator that is dirty, rough, or out of round. A common cause of arcing is worn or binding brushes, or when brush spring tension is too low.**

18. When installing single wires or wire bundles, how much slack is normally allowed between supports?
Slack between supports should normally not exceed one-half inch.

19. What precaution should be taken when running wires close to heating ducts or exhaust stacks?
The wires should be insulated with a high temperature resistant material.

Subject K- Lubrication Systems

1. What is straight mineral oil? **It is a type of natural lubricating oil that has no additives for foaming, cleaning, or viscosity.**

2. What is ashless dispersant (AD) oil? **It is a type of mineral oil with additives that evenly spread contaminates throughout the oil. The additives that are used do not form ashes.**

3. What is synthetic oil?
Synthetic oil is an oil that is man-made through the process of chemically altering the molecular structure of petroleum oil to achieve the desired characteristics.

4. What is meant by multi-viscosity oil?
It is a type of oil that has varying viscosity. When the oil is cold, it will have low viscosity, but when it warms up, the viscosity will increase for better lubrication. For example, 5w-30 has a viscosity index of 5 when it is cold, but 30 when it is warm.

5. What are the purposes of reciprocating engine oil? **It cleans, cools, cushions, seals, and lubricates parts.**

6. What is the most important property that aircraft reciprocating engine oil must possess?
Viscosity. (A measurement of frictional resistance to flow.)

7. What factors must be considered in determining the proper grade of oil to use in a specific engine?
The operating load, rotational speeds, and operating temperatures are the most important factors to be considered.

8. What is the purpose of the oil flow control valve "oil cooler bypass valve"?
When the oil is cool the valve will direct it around the oil cooler. When the oil is warm it will be directed through the oil cooler.

9. What are some oil contaminants? **Gasoline, moisture, acid, dirt, carbon, and metallic particles.**

10. From what location on a reciprocating engine is the oil temperature usually taken?
In either system, the bulb is located where it measures oil temperature before it enters the hot sections of the engine. In a dry sump lubrication system, the oil temperature bulb is located anywhere in the oil inlet line between the oil tank and the engine. Wet sump systems have the temperature bulb located where it senses the temperature after the oil passes through the oil cooler.

11. What do metallic particles on an oil screen indicate? **Metallic particles may be an indication of internal failure of the engine.**

12. What could cause oil foaming? **Foaming can be caused by diluted oil, contaminated oil, or the oil level is too high.**

13. What would be an indication of blocked oil cooler passages? **High oil temperature.**

14. What would be an indication of an inadequate oil supply? **Low oil pressure and high oil temperature.**

15. What type of oil is used in turbine engine lubrication systems? **Specially developed synthetic oils.**

16. Where can you find the specified grade of oil for a particular aircraft?
Oil grade can be found in the Airplane Flight Manual (AFM), or the Pilot's Operating Handbook (POH).

17. What are two types of oil coolers used in turbine engine lubrication systems?
The air-cooled oil cooler and fuel-cooled oil cooler are the two basic types in general use.

18. What is the meaning of oil flash point? Fire point?
Oil flash point is the temperature at which the oil will begin to give off ignitable vapors. The fire point is the temperature at which there are sufficient vapors to support a continuous flame.

19. What is the weight of aircraft engine oil? **Approximately 7.5 pounds per U.S. gallon.**

20. What is the purpose of an oil dilution system?
The oil dilution system thins the oil by introducing fuel into the lubrication system which makes cold weather starting easier. Fuel is used because it will evaporate out of the oil and leave through the crankcase breather.

21. What is the primary purpose of engine oil lubricant? **To reduce friction.**

22. What is the S.O.A.P. analysis? **S.O.A.P. is an oil analysis system that establishes a trend to measure engine health. One test does not do much unless something is very wrong.**

23. Where are carbon seals used in turbine engines? **Carbon seals are used in aircraft gearboxes, air-turbine motor starters, and main shaft seals.**

24. What is the key purpose of lubrication in a turbine engine? **For lubrication of the main shaft bearings.**

25. Where are engine oil filters located? **They are located between the oil pump output and the engine bearings.**

26. Why do reciprocating engines require oil with a high viscosity index? (Small changes in viscosity over a wide temperature range) Higher **viscosity indexes allow for easier starting in cold temperatures and prevents the oil from becoming too thin at operating temperatures to protect bearings under operating loads.**

27. Why do reciprocating engines require high viscosity oil? (oil flows slowly)
Higher viscosity oil performs better in reciprocating engines because they have large clearances, high operating temperatures, and high bearing pressures.

28. What two factors impact fluid viscosity? **Temperature and pressure, although pressure has a very small effect on viscosity.**

Subject L - Ignition and Starting Systems

1. What is a magneto? **A magneto is a self-contained AC generator driven by the engine for the purpose of ignition in a reciprocating engine.**

2. Why are magneto ignition systems preferred over battery type ignition systems for reciprocating engines?
Magnetos are an independent ignition source and do not rely on battery power to provide ignition.

3. What can cause a reciprocating engine to continue to run when the ignition switch is in the "off' position?
If there is a break in the p-lead wire from the magneto to the switch, then the ignition switch cannot ground the magneto primary circuit.

4. What is the purpose of the condenser in a high-tension magneto electrical system?
To prevent arcing at the points and to hasten the collapse of the magnetic field around the primary coil.

5. Where is the E-gap position?
The E-gap position is when the poles of the rotating magnet are a few degrees past the neutral position. E-gap is the position at which the points begin to open.

6. What are the three major circuits of a high-tension magneto system?
The magnetic circuit, primary electrical circuit, and secondary electrical circuit.

7. What are the components of a high-tension magnetic circuit?
The magnetic circuit consists of a permanent rotating magnet, soft iron core, and pole shoes.

8. What happens when the primary breaker points open in a magneto?
Opening the breaker points stops the flow of current in the primary coil. The magnetic field that was emitted by the primary coil collapses. As this magnetic field collapses, the flux lines that cut across the windings of the secondary coil induce a pulse of high voltage current in the secondary coil needed to fire the spark plugs.

9. What is the piston position when the spark occurs in a cylinder?
The piston is a specified number of degrees before top dead center on the compression stroke.

10. What is a dual magneto?
The dual magneto incorporates two magnetos in one housing. They share the rotating magnet and cam, however they have their own sets of points, coils, and distributer blocks.

11. What is the difference between a low tension and a high-tension ignition system?
In the high-tension system, the high voltage is generated in the magneto and flows too the plugs through high tension leads. In low tension systems, the low voltage is generated in the magneto and flows through low-tension leads to the primary winding of a transformer coil located near each spark plug. There the voltage is increased to high voltage by transformer action and is conducted to the plugs by very short high-tension leads.

12. When the ignition switch is in the OFF position, what is the condition of the primary circuit?
It is completed through the ignition switch to ground.

13. What three conditions are required to fire plugs in a cylinder when the piston is in the prescribed position? **The magneto's magnet poles must be in the E-gap position, the breaker points must open, and the distributor rotor must be aligned with a distributor electrode for that cylinder.**

14. What is a dual ignition system, and what part of the system is grounded when the ignition switch is placed in the RIGHT position? **A dual ignition system uses two separate magnetos with the harness arranged so that each magneto fires one plug in each cylinder. If the switch is set to right, the left magneto will be grounded, preventing it from firing.**

15. What is internal timing of a magneto? **It is adjusting the breaker points to open when the poles of the rotating magnet are at the E-gap position.**

16. What is the purpose of an impulse coupling used with a magneto?
The impulse coupling is used to retard the timing of the spark to after top dead center for starting the engine. It provides a momentarily high rotational speed to produce a spark at low crankshaft rpm.

17. What is staggered ignition timing? **It is the firing of one spark plug before the other. Instead of firing them simultaneously.**

18. What is the proper spark plug reach? **The proper spark plug reach is when the electrode end of the plug inside the cylinder is in the best position to achieve ignition.**

19. Why is it important to keep track of the cylinders that spark plugs are installed in?
Because spark plugs can provide a lot of information about the health of a specific cylinder.

20. What type ignition system is used in most turbine engines?
A typical turbine engine is equipped with an electronic capacitor type ignition system.

21. What is the function of the igniter plugs in a turbine engine?
The function of the igniter plug is to provide a discharge gap for the current, which is stored in the capacitor. The discharge results in a high intensity spark which ignites the fuel-air mixture.

22. When are turbine engine ignition systems normally in use? **The ignition system is required only for starting or restarting an engine.**

23. What are two types of igniter plugs?
Annular gap - A long-reach plug that extends into the combustion chamber.
Constrained gap - A short-reach plug that does not extend into the chamber because the spark does not remain close to the plug.

24. What is the purpose of the dual magneto configuration? **For redundancy and safety, in case one magneto fails.**

25. How can you tell if a starter commutator is dirty or worn? **An excessively noisy starter.**

26. What does it mean when the starter relay clicks when the starter switch is placed in the "start" position?
This indicates that the supply voltage is too low to supply enough current to the relay coil to fully engage the contact points.

27. What is an advantage of air-turbine starters, when compared to electric starters, for large turbine engines?
They are light weight, and do not have the same cool down periods as electric starters.

28. Why do turbine ignitors not get carbon fouled as often as reciprocating engine spark plugs?
Due to extremely high rates of electrical discharge in the turbine ignitors.

29. What are the three parts of an ignition systems of a turbine? **Exciter, Ignition lead, Ignitor**

30. What is the difference between a temporary magnet and a permanent magnet? **A permanent magnet is one that retains its magnetic properties for a long period of time. Temporary magnets also called an electromagnet are those that simply act like permanent magnets when they are within a strong magnetic field or have current flowing near them.**

Subject M - Fuel Metering Systems

1. Where are the fuel spray nozzles located in a turbine engine?
They are located either externally or internally on the combustion chamber in such a way that the fuel can be sprayed into the combustion area.

2. Name the heat sources for the operation of fuel heaters used in turbine engines.
Turbine engines use heat exchangers to heat the fuel and prevent the possibility of ice crystal formations. Fuel lines are routed through the fuel heater, which uses a heat source, either bleed air, or engine lubricating oil. If bleed air is used as a heat source it is called an air-to-liquid heat exchanger. When oil is used, it is a liquid-to-liquid heat exchanger.

3. What engine variables are sensed by a hydro mechanical fuel control?
The fuel control senses power lever position, rpm, compressor inlet pressure temperature, burner pressure, or compressor discharge pressure, and EGT or TIT.

4. What are the two most commonly used carburetors in small reciprocating engines?
They are the float-type carburetor and pressure-type carburetor.

5. What type of fuel control unit is used in a turbine engine?
Both hydro mechanical and electronic fuel control units are in use today. However, the most common fuel control unit is the hydro mechanical type.

6. What is meant by trimming a turbine engine? **Adjusting the fuel control for the proper specific gravity of the fuel and for the proper idle and full throttle RPM.**

7. When should a turbine engine be trimmed? **Whenever there is a loss in engine power, or the manufacturer specifies.**

8. What specifications are used to trim a turbine engine?
The data plate on the engine typically contains the trimming specifications.

9. What are two types of electronic fuel controls for turbine engines?
Supervisory EEC (Electronic Engine Control) and FADEC (Full-Authority Digital Electronic Control). (There is also a 3rd type called mechanical)

10. What is a FADEC?
A Full-Authority Digital Electronic Control. It is a high-precision digital electronic fuel control that utilizes an Electronic Engine Control and the Flight Management Computer to measure the fuel nozzles that prevent over-speed and over-temperature conditions. The FADEC also sends information to indication systems for the aircraft crew.

11. Does a turbine engine controlled by a FADEC require manual trimming? **No, the FADEC is self-trimming.**
12. What is the purpose of a mixture control in a float type carburetor? **It is to control the fuel-air mixture as air density changes with altitude changes.**

13. What is the purpose of an accelerating system on a float-type carburetor?
When the throttle is opened rapidly, the fuel-air mixture will lean out momentarily. To overcome this tendency, a charge of fuel from the accelerating pump will temporarily enrich the mixture in the Venturi.

14. Describe the purpose and operation of a venturi?
The venturi in a carburetor is an example of Bernoulli's Principle, which states "As the velocity of a gas or liquid increases, the pressure decreases." The venturi performs three functions. It proportions the fuel-air mixture, lowers the pressure at the discharge nozzle, and limits airflow at full throttle. The principal operation of the carburetor depends on the differential between the atmospheric pressure, and the decreased pressure offered by the venturi.

15. What is the function of a metering jet?
Its purpose is to limit the fuel flow when the throttle valve is wide open. The main metering jet is placed in the fuel passage between the float chamber and the discharge nozzle.

16. What is the fuel metering force in a float-type carburetor?
It is differential pressure between the pressure in the float chamber and at the nozzle.

17. What will be the result of using excessively rich idle mixtures?
Excessively rich idle mixtures will cause carbon fouling of the spark plug.

18. What is the purpose of the economizer system in a float carburetor
The economizer is essentially a valve which is closed at throttle settings below 60% - 70% of rated power, but provides additional fuel for cooling the engine to prevent detonation at higher throttle settings above 60% - 70%.

19. Where does a pressure injection carburetor obtain fuel pressure?
It obtains fuel pressure from the boost pump for starting and from the engine driven fuel pump for normal operations.

20. What operates an automatic mixture control (AMC) on a pressure carburetor?
The AMC contains sealed bellows that expand or contract with changes in atmospheric pressure. The movement of the bellow operates a tapered needle that controls the impact air pressure into the "A" chamber of the carburetor.

21. In what position do you place the mixture control of a pressure injection carburetor to stop the engine?
In the idle cutoff position.

22. What rpm indication should result when the mixture control is placed in the idle cutoff position when the idle mixture is set correctly? **There should be a slight increase in rpm, followed by a rapid drop of rpm to zero.**

23. What is the purpose of filling a pressure injection carburetor full of fuel and allowing it to soak for a period of about eight hours prior to installation? **To soften the diaphragms and make them as pliable as they were when the carburetor was originally calibrated.**

24. What are three types of carburetor icing? **Throttle icing, impact icing, and fuel evaporation icing.**

25. What is the typical fuel pressure in a float type carburetor? **3-5psi.**

Subject N - Engine Fuel Systems

1. What is the purpose of filters in a fuel system? **They are used to prevent foreign matter from entering the carburetor.**

2. Why do carburetors in aircraft have a mixture control? **Because air density changes with altitude, which affects the air-fuel mixture. The mixture control provides a means to adjust for the correct mixture at different altitudes.**

3. What two items are adjusted when setting idling conditions on a float carburetor? **The throttle stop for idling RPM, and the idle mixture through the idle needle valve.**

4. What is the purpose of fuel selector valves? **They provide a means of shutting off fuel flow, cross-feed for tank and engine selection and for fuel transfer.**

5. What should be looked for when inspecting an engine driven fuel pump? **Look for fuel leaks and security of mounting.**

6. What is the purpose of an engine driven fuel pump? **The engine driven fuel pump always delivers a continuous supply of fuel at the proper pressure during engine operation.**

7. What type of fuel pump is generally used with large reciprocating engines? **A positive-displacement rotary-vane-type pump.**

8. What happens to the excess fuel not required by the engine in a constant displacement pump?
The pressure relief valve opens, and the fuel is routed back to the inlet side of the pump.

9. What is the most common type of fuel boost pump? **The electrically driven centrifugal type pump.**

10. What are the functions of the boost pump?
First, during starting the boost pump supplies fuel to the engine pump for starting. Also, they are used to maintain pressure in the fuel lines to prevent the fuel from boiling off at altitude. Finally, boost pumps act as a backup if the engine driven pump fails.

11. What is the purpose of the bypass valve in the engine driven fuel pump?
The bypass valve provides a path around the pump vanes for starting the engine, and to allow fuel to bypass the pump in case of a pump failure.

12. What is the purpose of using boost pumps in a fuel system?
Electric boost pumps are used to supply fuel to a pressure carburetor during engine starting and in case of engine driven pump failure. However, a main function of a boost pump to keep the pressure on the suction side of the engine driven pump from becoming low enough to permit the fuel to boil when operating at high altitudes.

13. What are the three general causes of vapor lock? **Low fuel pressure, high fuel temperatures, and excessive fuel turbulence.**

14. Turbine engine fuel pumps may be divided into what two distinct system categories? **Constant displacement and variable displacement.**

15. What category is a turbine engine driven gear-type pump? **Constant displacement.**

16. What type of fuel pump can be made to vary the fuel flow at any speed? **A variable displacement pump.**

17. What part of a gas turbine engine fuel system is very susceptible to the formation of ice? **The fuel filters.**

18. How is the engine fuel system protected from ice formation? **Using fuel heaters.**

19. Why is a micron fuel filter provided with a bypass valve as a necessary safety factor?
Because the small openings in this type of filter make it very susceptible to clogging.

20. Where are fuel filters located? **They are located at the fuel pump, in line with the system; "Last chance" filter screens are in the fuel controls.**

21. Can you use automotive gasoline in a reciprocating engine in place of Avgas? **Yes, if you have a STC.**

Subject O - Induction and Engine Airflow Systems

1. What are the three major parts of a reciprocating engine induction system?
The air scoop, fuel delivery system, and intake manifold.

2. What effect does induction system icing have on engine performance?
Induction system icing can cause an engine to act erratically and lose power and may possibly quit.

3. What method is used to prevent or remove induction system ice in a reciprocating engine?
The most common method of preventing or removing ice formation in the induction system is by the use of heated air.

4. How is ice cleared in some aircraft induction systems if the carburetor heat is too low to clear the ice?
Anti-icing fluids such as alcohol, is sprayed into the induction system ahead of the carburetor. The fluid will dislodge the ice which is ingested by the engine.

5. What engine indication can be the result of a dirty air filter? **Low power.**

6. What is the danger of using carburetor heat when operating at high power settings?
The higher air temperatures could cause detonation and possible engine failure.

7. Carburetor throttle ice is most likely to form when the throttle is in which position?
When the throttle butterfly is in the partially closed position.

8. What are two general classifications of superchargers used in reciprocating engine induction systems?
They are classified as internally driven, or externally driven supercharger systems.

9. What is the purpose of a distribution impeller in a radial engine?
It is designed to break up the fuel globules into finer particles for better distribution to the cylinders.

10. How does an internally driven supercharger get its power?
Internally driven superchargers are mechanically engine driven. A high-speed impeller is driven through a gear train from the crankshaft. The use of gear ratios can be single stage or two speed. A two speed gear ratio normally varies from 6:1 to 12:1.

11. Where does an externally driven supercharger get its power?
By the exhaust gases that are directed against a turbine. For this reason, they are commonly called turbochargers.

12. What unit regulates the amount of exhaust gases to the turbine of a turbocharger? **The waste gate.**

13. What type of power is used to control the position of the turbocharger waste gate on some engines?
Oil pressure to an actuating piston.

14. What can cause the waste gate to stick?
A buildup of carbon can cause the waste gate to stick

Subject P - Engine Cooling Systems

1. What is the most common means of regulating the cooling air flow through a reciprocating engine?
Using cowl flaps.

2. What is the purpose of the fins on engine cylinders?
To increase the surface area of the cylinder for cooling.

3. What other engine characteristics are designed to aid in engine cooling besides cooling fins?
The engine cowling and baffles are designed to force air through the cylinder cooling fins.

4. Why is the "open and close" adjustment during installation of cowl flaps important?
For each engine installation, the cowl flaps are set for a tolerance that will permit them to open and close in the correct amount to keep the cylinder head temperature within allowable limits.

5. What should be done to cylinders when too much of the cooling fin area is broken off?
The cylinder should be replaced because it cannot cool properly, and a hotspot will develop.

6. When should cowl flaps be kept in the fully open position?
Normally during all ground run operations.

7. What publication should be referred to before re-profiling cylinder cooling fins?
The manufacturer's service, or overhaul manual should be used to obtain the allowable limits.

8. What power sources are used to operate the cowl flaps?
Cowl flaps may be operated by electrical power, hydraulic power, or manually.

9. What is the purpose of blast tubes?
To direct jets of cooling air to accessories of the engine that have high heat concentrations (such as a generator.) On radial engines they duct air onto the rear spark plug elbows of each cylinder to prevent overheating of the ignition leads.

10.What are the main reasons that excessive heat in a reciprocating engine is undesirable?
Excessive heat shortens the life of the engine parts, impairs lubrication, and affects combustion.

11. Describe the augmenter system.
The augmenter system is used to help keep the temperature of air-cooled engines down by using exhaust gas energy to draw cool air over the engine.

12.What is the source of air directed to engine bearings for cooling?
Bleed air from the compressor section of the engine.

13.What is the purpose of insulation on the exhaust duct of a turbine engine?
To reduce the temperature of the structures in the vicinity of the exhaust duct or afterburner, and to eliminate the possibility of fuel or oil coming into contact with the hot parts of the engine.

14.What types of materials are used to make insulation blankets for turbine engines?
They are made of stainless steel, layers of aluminum foil, fiber glass, and silver foil.

15.What areas of a turbine engine are cooled by the secondary air passing through the engine?
The combustion chamber and the turbines.

16. What is the purpose of an engine cowling? **It streamlines the engine to reduce drag and forms an envelope around the engine, which forces the airstream between the cylinders to cool them.**

17. What is the purpose of an oil cooler bypass valve?
It allows the thick oil to bypass the cooler when the oil is cold.

Subject Q - Engine Exhaust and Reverser Systems

1. What are two types of reciprocating engine exhaust systems? **The short stack system and collector system.**

2. What are the possible hazards of exhaust system failure? **It can result in carbon monoxide poisoning of the crew and passengers, or partial or complete loss of engine power and an aircraft fire.**

3. What type of exhaust system is generally used on low powered non supercharged engines? **The short stack system.**

4. What type of exhaust system is used on turbocharged engines? **The exhaust collector system.**

5. What type of exhaust system creates a higher exhaust back pressure? **The collector system.**

6. What is the purpose of a reciprocating engine exhaust system? **It is used to remove heat and noxious gases from the engine nacelle.**

7. What happens when lead, zinc, or galvanized marks are made on an exhaust system?
The mark is absorbed by the metal when heated and causes a change in the molecular structure that weakens the metal.

8. What type of visual indication can usually be seen in the area of an exhaust leak?
Exhaust leaks usually leave flat gray or sooty black carbon streaks on the pipes in the area of the leak.

9. How are ceramic coated exhaust stacks cleaned? **By the degreasing method only.**

10. What is the usual cause of muffler and heat exchanger failures?
They are usually caused by concentrated areas of thermal stress, or vibration stress.

11. What is the most common form of damage in exhaust systems?
Cracks that are the result of repeated expansion and contraction.

12. What should be the position of the waste gate when starting an engine? **Fully open.**

13. Where are exhaust manifold and stack failures most likely to occur?
These failures usually occur at welds, flanges, or clamped points in the system.

14. What is a common cause of the waste gate unit malfunctioning in a turbocharger system?
The most common cause of waste gate malfunctioning is carbon buildup, "coke buildup" causing the waste gate valve to stick in the closed position.

15. What factors are affected if the area of the exhaust nozzle of a turbine engine is changed?
The size of the exhaust nozzle affects both the engine performance and the exhaust gas temperature.

16. Why are thrust reversers not normally used during ground operations?
The danger of blowing foreign objects up into the intake stream is too great.

17. What are the probes in a turbine exhaust pipe used for?
They are used to measure exhaust gas temperature (EGT) and pressure.

18. Why do you disassemble and inspect the collector type exhaust?
Exhaust system failure can result in carbon monoxide poisoning of crew and passengers.

19. What is the purpose of the waste gate on a turbo-charged exhaust?
This valve controls the amount of exhaust gases forced through the turbo charger turbine. When the gate is fully closed all gases must pass through the turbine

20. Name two types of thrust reversers. **They are mechanical blockage type and aerodynamic blockage type.**

Subject R – Propellers

1. What is the purpose of a propeller? **To create thrust and either pull or push the airplane through the air.**

2. What are the two types of propeller configurations? **The tractor type and pusher type.**

3. What type of propeller has the blade angle built into the propeller and cannot be changed?
A fixed pitch propeller.

4. What is the purpose of the metal tipping on a leading edge of a wooden propeller?
It is to protect the propeller from damage caused by FOD (foreign object damage) in the air, during landing, taxiing, and takeoff.

5. What tool is used to determine propeller blade angle? **A universal propeller protractor.**

6. What are the aerodynamic forces and loads acting on a rotating propeller blade?
A rotating propeller is acted upon by centrifugal force, aerodynamic twisting, centrifugal twisting, torque bending and thrust bending forces.

7. What is the meaning of propeller blade "back" and "face?"
The curved side of the propeller is called the blade back. This is the side that faces away from the engine. The flat side of the propeller is known as the blade face. This side of the blade faces the engine. If you are sitting in the cockpit, you will be looking at the face of the blade.

8. What should be used to clean aluminum and steel propeller blades and hubs?
They should be washed with a suitable cleaning solvent using a brush or cloth.

9. What positions are used on a balance stand to check a two bladed propeller for static balance?
First the vertical position, and then the horizontal position.

10. Can a fixed pitch propeller's pitch be changed? **No, they are fixed at a specific pitch angle.**

11. Why do you put the blades of a counterweight propeller into high pitch before stopping the engine?
This type of propeller has a movable cylinder that slides over a fixed piston. In the low pitch position, the cylinder is outboard, and the piston is exposed to the open air. In the high pitch position, they cylinder moves inboard and covers the piston. In this position, the piston is protected from dirt and moisture in the air. This is particularly important if the airplane engine will not be operated for several days.

12.Why are cones installed on splined shafts with a propeller? **The cones center the propeller on the shaft as they are forced toward each other by the tightening of the retaining nut.**

13. How is feathering accomplished on a constant speed counterweight propeller?
By releasing governor oil pressure on the counterweights. The feathering spring moves the blades to the feathered position and the oil returns to the engine.

14.What types of systems are used for deicing propellers? **Fluid or electrical deicing systems.**

15.What is the purpose of a slinger ring on some propeller installations?
Propeller deicing fluid is ejected from a stationary nozzle on the engine into a U-shaped channel attached to the rear of the propeller assembly. The U-shaped channel is called the slinger ring. The fluid under pressure of centrifugal force is transferred through small tubes to the propeller's leading edge.

16.What is blade tracking?
It is the process of determining the position of the tips of the propeller blades relative to each other.

17. Do the counterweights on a constant speed propeller increase or decrease the blade angle?
The centrifugal forces of the counterweights increase the pitch of the blades.

18.What should you adjust if a pilot request 50 more rpm on an aircraft equipped with a constant speed propeller? **Adjust the governor's prop-lever set screw.**

19.What adjustments are powerplant mechanics allowed to make to the prop governor? **Only the maximum RPM stop.**

20.Why are propellers indexed to the crankshaft of an engine? **To reduce vibrations to a minimum.**

21. Can transverse cracks in a propeller be repaired? **No, transverse cracks of any size are unacceptable.**

22.What is the alpha range and beta range of a propeller? **Beta range is the condition of the propeller during ground operations and in the reverse pitch position. Alpha range is the propeller position when the aircraft is in flight.**

23. When changing metal bushings on a wooden propeller assembly, a thorough inspection of the bolt holes should be accomplished. Why? **To check for elongation of the holes.**

24. What happens to a constant speed feathering propeller when the propeller governor's oil pressure drops to 0 psi? **The low pitch stop engages to prevent blade angle changes.**

25. What is the purpose of an arbor when balancing a propeller? **To support the propeller on the balance knives.**

Subject S - Turbine Powered Auxiliary Power Units

1. What is the typical relationship between an aircraft's auxiliary power unit (APU) generator and the engine driven generator? **They are identical.**

2. Where does the APU fuel supply normally come from? **The airplane's main fuel supply.**

3. How is the APU rotated during start up? **With an electric starter.**

4. What is the function of an APU air inlet plenum? **It is to stabilize the pressure of the air before it enters the compressor.**

5. When operating at high loads, what is the speed of an APU? **The APU remains at or near rated speed regardless of the load condition.**

6. What is the effect of the pneumatic power when being used in conjunction with maximum APU shaft power output? **The pneumatic loading will be automatically modulated to maintain a safe EGT.**

7. Before shutting down, how would APU cooling be accomplished? **By closing the bleed air valve, thus removing the load.**

8. When is most of the load placed on an APU? **When the bleed air is opened.**

9. What regulates fuel scheduling during APU start and under varying pneumatic bleed and electrical loads? **Fuel scheduling is maintained automatically by the APU fuel control system.**

10. How is most troubleshooting accomplished on modern APUs? **By gathering information from the FADEC.**

11. What is the primary function of the load compressor on APUs equipped with a free turbine and load compressor? **To provide bleed air for aircraft pneumatic systems.**

12. To prevent rotor seizure "shock cooling," how long should an APU idle before being shut down? **3 to 5 minutes.**

13. What is the function of the APU on a modern transport category aircraft? **Provides Bleed air for engine starting, air conditioning, de-icing.**

Appendix 1 - Practical Projects & Assignments

APPENDIX 1 - PRACTICAL PROJECTS AND ASSIGNMENTS		
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FAR Research

FAR 43.11 (a)(4) – Covers logbook entries for inspections.

Please copy the statement that would be entered in the logbook after performing a 100-hour inspection, if the aircraft is determined to be airworthy.

____

____

____

FAR Part 45 – (Markings)

FAR 43, Appendix A – List of major repairs, major alterations, and preventative maintenance.

Please find and read the following:

Airframe major repairs – paragraph (b)(1)(xxii)

Powerplant major repairs – paragraph (b)(2)(i)(ii)(iii)

FAR 43, Appendix D – Scope and detail for a 100-hour or annual inspection. (checklist)

List the paragraph (a,b,c,d etc.) that provides the checklist for a 100-hour inspection for the following:

Airframe empennage: ____________________

Engine: ____________________

Landing gear group: ____________________

What are the height requirements for the nationality and registration markings for the following aircraft? List the paragraph(s) where the requirement is found.

1941 P-51 Mustang War Bird restored to its original condition and flown only during the making of movies:

FAR 45.22, paragraph______________ Height requirement__________________

1941 J3 Piper Cub flown for personal pleasure only.

FAR 45.22, paragraph______________ Height requirement__________________

1949 Cessna 172RG repainted in 1994.

FAR 45.29, paragraph______________ Height requirement__________________

Any non-spherical balloon.

FAR 45.29, paragraph______________ Height requirement__________________

What would be the location of the marks on a spherical balloon?

FAR 45.29, paragraph______________ Height requirement__________________

FAR Part 65 (Privileges and Limitations)

FAR 65.21 – Change of Address.

Who must be notified after any change in your permanent address? ______________________________

Where must the notification be sent? ____

Within how many days after the change in the mailing address must eh notification be made? ______________

FAR 65.83 – Recent experience requirements.

What are the recent experience requirements for a mechanic?

A certified mechanic may not exercise the privileges of his certificate and rating unless within the preceding _____months he has, for at least ______months, served as a ___________________under his certificate and rating, or technically ______________________other mechanics, or supervised, in an executive capacity, the __________________ or _______________________ of aircraft or has been engaged in any combination of par. (b)(1)(2)(3), or the _________________________ has found that he is able to do that work.

FAR 65.89 – Display of Certificate.

Where is the mechanic required to keep his license (certificate)?

In the _________________area where he normally exercises the privileges of his license.

Who are the five persons that have the right to inspect your license?

The ________________ or an authorized _______________ of the National Transportation Safety Board, or any __________________________, ____________________ or ______________________law enforcement officer.

FAR Part 91 – (The Owner's/Operator's FAR)

FAR 91.205(b) – Instruments and Equipment – Visual Flight Rules (day).

You do not need to read this section word for word. Scan paragraph(b) so you will be familiar with and know where to find the instruments and equipment required to operate the aircraft for VFR flight during the day. For example: the **airspeed indicator, the altimeter, magnetic direction indicator, tachometer for each engine, etc.**

FAR 91.207 (c)(d) – Emergency Locator Transmitter (ELT).

When must the batteries used in the ELT be replace (or recharged, if the batteries are rechargeable)?

When the transmitter had been in use for more than _____hour, or when _______ percent of their __________life is lost. For ____________batteries __________ percent of ______________life charge.

How often must the ELT be inspected and what does the inspection check for?

The ELT must be inspected within _________ months after the last inspection. The inspection is checking for

(1) _______installation, and (2) battery __________operation of the (3) _____________and ___________

(4) the presence of a sufficient _____________ radiated from its _________________________.

What frequency is used to test the ELT and how can it be tested?

Note: Answer is not found in this FAR. It can be found in the FAR/AIM (Airman's information Manual).

The ELT may be tested by turning the VHF communication receiver to **121.5** Mhz. The test should be conducted only during the **first five** minutes of any hour and should be restricted to **three** audio sweeps.

FAR 91.213 (d)(3)(i)(ii) – Inoperative Instruments and Equipment.

An aircraft may be operated with inoperative instruments and equipment without an approved MEL (minimum Equipment List) **provided** the inoperative instruments and equipment are EITHER…

(i) Removed from the aircraft, the cockpit control placarded and the maintenance record in accordance with FAR 43.9 or…

(ii) The instruments and equipment are _________________ and ______________________________ "__________________" If the deactivation involves maintenance, it must be accomplished and recorded **in accordance with FAR 43.9**. (a logbook entry must be made).

FAR 91.411 (a)(1) – Altimeter Testing.

In order to operate an airplane or helicopter in controlled airspace under ____________, the altimeter instrument must be tested and inspected within the preceding _____________________ months and found to comply with FAR ____________, Appendix__________.

FAR 91.413 (a) – ATC Transponder Test and Inspection.

No person may use an ATC transponder unless, within the preceding ________________months, the ATC transponder has been tested and inspected and found to comply with FAR_____, Appendix __________.

FAR Part 91 – (The Owner's/Operator's FAR)

FAR 91.205(b) – Instruments and Equipment – Visual Flight Rules (day).

You do not need to read this section word for word. Scan paragraph(b) so you will be familiar with and know where to find the instruments and equipment required to operate the aircraft for VFR flight during the day. For example: the **airspeed indicator, the altimeter, magnetic direction indicator, tachometer for each engine, etc.**

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Temperature Conversions

You will be allowed to look up the formulas for temperature conversions during your test. You can find them in the FAA-H-8083-30A (General Handbook). The formulas listed below vary slightly from the ones found in the handbook and may be easier to work.

Celsius to Fahrenheit

When converting to Celsius to Fahrenheit, you are going from a smaller number to a larger number. There are two ways to make number larger. When you **multiply and add** to a given number, the number gets larger. The number you would use when multiplying is 1.8 and the number you would use when adding is 32. The formula for converting from **Celsius to Fahrenheit** would be as follows:

$$C * 1.8 + 32 = F$$

$$\text{E.g., } 14 * 1.8 + 32 = 57.2°F$$

When converting from Fahrenheit to Celsius, you are going from a larger number to a smaller number. There are two ways to make a number smaller. When you **subtract and divide** by a given number, the number gets smaller. The number you would use when subtracting is 32, and the number you would use when dividing is 1.8. You must **subtract first, then divide**. The formula for converting **Fahrenheit to Celsius** would be as follows:

$$F - 32 \div = C$$

$$\text{E.g., } 82 - 32 \div 1.8 = 27.7°C$$

Using the above formulas, convert the following. Please show your work.

22°C to F____

49°C to F____

40°F to C____

92°F to C____

-12°F to C____

AC 43.13 – 1B Research

Chapter 2, paragraph ________, page__________.

What is the required **strength criteria for fabric** if performing a fabric punch test on an aircraft with a wing loading of 9 psf or greater or a placard *never exceed speed of 160mph or greater*? ________________

(Note: As soon as fabric comes off the roll, it is considered to be deteriorated).

Chapter 2, Table______________

What type of fabric would be used on an aircraft with a wing loading of 7 psf and a never exceed speed of 130 mph? ______________________________

Chapter 2, Figure_____________

What would be the rib stitch spacing for an aircraft with a VNE of 200mph in the slip stream? ___________

What would be the rib stitch spacing for an aircraft with a VNE of 200mph other than in the slip stream?

____

Chapter 2, paragraph 2-9, c.

What does *in the slip stream* (propwash) mean? ____

____

Find the repair for an elongated **wooden spar** bolt hole. Chapter ___________, paragraph ________________

Find the instructions for installing fittings on a high-pressure hose. Chapter ____________, Figure ____________

According to the Figure, what is the **extra step** that must be completed for installing fittings on a **high-pressure** hose?

____

____

How does the hydrostatic test have to be performed on a standard weight cylinder? (Portable fire extinguisher)

(Note: AC 43.13-1B does not provide any data specifically on fire extinguishers. The testing frequency is the same as for the oxygen standard weight cylinder.)

Chapter __________, paragraph __________

Standard weight cylinders must be hydrostatically tested at the end of each __________ year period.

Find the table of filling pressures for oxygen cylinders. To what pressure would you fill an oxygen cylinder if the temperature is 23°C? Chapter ______________ Table ________________

Step 1.

Convert 23°C to F using the formula:
C*1.8+32=F

=23*1.8+32

=41.4+32

=73.4°F

Step 2.

According to the Table, the filling pressure for...

70°F – 1975psi

80°F – 2000psi

Step 3.

To determine the filling pressure for 73.4, calculate as follows:

80°-----------------2000psi

-70°-----------------1975psi

10°-------------------25psi

25psi ÷10° = 2.5psi

(2.5 is the increase in psi for each degree above 70°)

Remember...our temperature is 3.4° above 70°

3.4° * 2.5psi = **8.5 (total increase in psi)**

70° -------------1975 psi

+3.4°------------8.5 psi

73.4°------------1983.5 psi

Following the above example, to what pressure would you fill an oxygen cylinder if the temperature is 15°C?

(Note: Some numbers are filled in for you to help keep track. Please complete the rest of the problem.)

Step 1.

Convert 15°C to F using the following formula:

C * 1.8 + 32 = F

Step 2.

According to the table, the filling pressure for...

50°F - ______

60°F - ______

Our temperature is ______ (______ above 50°)

Step 3.

To determine the filling pressure for ______________

Calcúlate as follows

60°-----------------1925psi

-50°----------------- ___ psi

10°-------------------25psi

___psi ÷ 10° = ______psi

(___ is the increase in psi for each degree above 50°)

______degrees * ______psi = ________

Step 4.

50° -------------______ psi

+ ___°------------ ___ psi

To what pressure would you fill an oxygen cylinder if it is -5°C

Step 1.

Step 3.

Step 2.

Step 4.

List Five main types of corrosion. Chapter______________, Section ______________.

1.____________________

2. ____________________

3. ____________________

4. __________________________

5. __________________________

What are two types of liquids used to protect aluminum from corrosion? (Not clearly stated in AC43.13-1B)

1. **Alodine**
   The registered trade name for a conversion coating chemical which forms a hard, unbroken oxide film on a piece of aluminum alloy.

2. **Zinc chromate primer**
   A primer used to prepare a metal surface to take a topcoat of paint of and helps slow the formation of corrosion.

Weight and Balance

Terms and Definitions

Datum – An imaginary vertical reference plane or line chosen by the aircraft manufacturer from which all arms used for weight and balance computations are measured.

Arm – The horizontal distance in inches between the datum and the center of gravity of an object. An item located **in front of the datum** will have a **negative** arm. An item located **behind the datum** will have a **positive** arm.

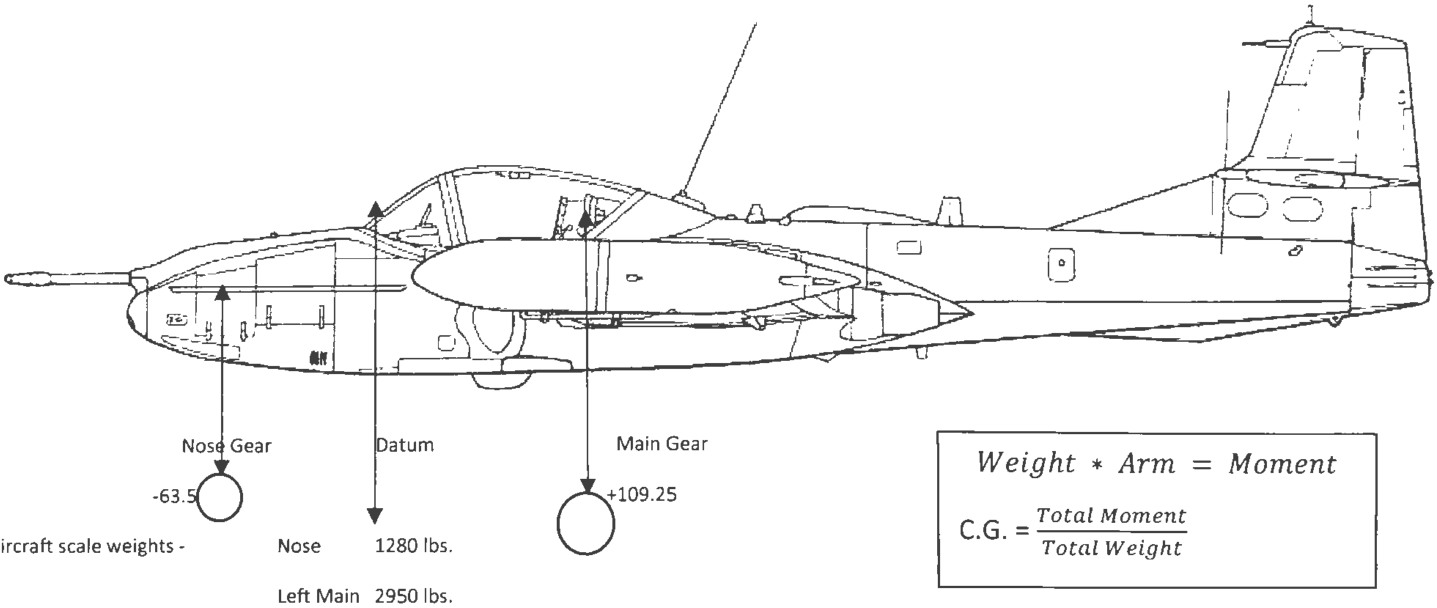
C.G. – Center of gravity. The point at which an airplane would balance if suspended. The CG is measured in inches from the datum.

Moment - A measurement of force at a given point. For aircraft weight and balance, the moment is calculated by taking the weight and multiplying it by the arm. This gives a working force known as In-lbs. (inch pounds)

Tare Wt. – The weight of items used during the aircraft weighing process. Examples of tare weight include chocks, blocks, jack pads, etc. Tare weight **IS NOT** part of the aircraft empty weight.

Unusable Fuel – Also known as residual fuel. The fuel that is left over in the lines, pumps, sumps and tanks that cannot sustain the engine to run. However, it is always on board and IS considered part of the empty weight.

Useful load – The difference between the aircraft empty weight and the aircraft gross/maximum weight. The useful load would include pilot/co-piglet, baggage and usable fuel.



$$\textit{Weight} * \textit{Arm} = \textit{Moment}$$

$$\text{C.G.} = \frac{\textit{Total Moment}}{\textit{Total Weight}}$$

Aircraft scale weights -

Nose	1280 lbs.
Left Main	2950 lbs.
Right Main	2950 lbs.

When the aircraft was weighed, the jack pads were left attached to the jack points. The two jack pads weighed 12.4 lbs. **each** and were located at station +86.4. The unusable fuel, weighing 96.3 lbs. had been completely drained from the fuel system at station +102. **What is the empty weight and empty weight C.G. for this aircraft?**

Item	Weight	Arm	Moment
Total			

Empty Weight = ____________________

Empty Weight C.G. = ______________

Weight and Balance Practice Problems

Practice 1

Aircraft empty weight:	1667 lbs.
Empty weight C.G.:	+26.5
Gross/Max weight:	2265 lbs.

The aircraft was altered as follows:

1. The battery weighing 33.5 lbs. at Station -14 was relocated to station +32.3
2. A rotating beacon weighing 4.8 lbs. was installed on the bottom of the fuselage at station +19.
3. A fire ext. weighing 3.5 lbs. was installed at station -2.

What is the new empty weight? _______________

What is the new empty weight C.G.? ___________

What is the useful load? _____________________

Item	Weight	Arm	Moment
Total			

Practice 2

A Piper PA-22-150 weighed 1125 lbs. at a C.G. of +23.25 before removing the three-wheel skirts per an STC. The nose wheel skirt located at -14 weighed 11.25 lbs. The **two** main wheel skirts located at +31.8 weighed 16.33 lbs. **each**. The max/gross weight of the aircraft is 1645 lbs.

What I the new C.G.? ___________________

What is the useful load? _________________

Item	Weight	Arm	Moment
Total			

Basic Electricity

EXAMPLE

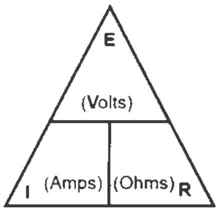
"W" ------------------WATTS-------------------POWER

"I" ---------------------AMPS--------------------CURRENT

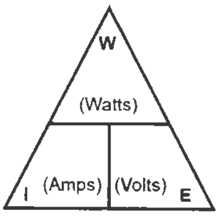
"R" --------------------OHMS--------------------RESISTANCE

"E" --------------------VOLTS-------------------ELECTROMOTIVE FORCE

OHM'S LAW



WATT'S LAW



TOTAL RESISTANCE

$$R^t = \frac{R^1 \; x \; R^2}{R^1 + R^2}$$

or

$$R^t = \frac{1}{\frac{1}{R^1} + \frac{1}{R^2} + \frac{1}{R^3}}$$

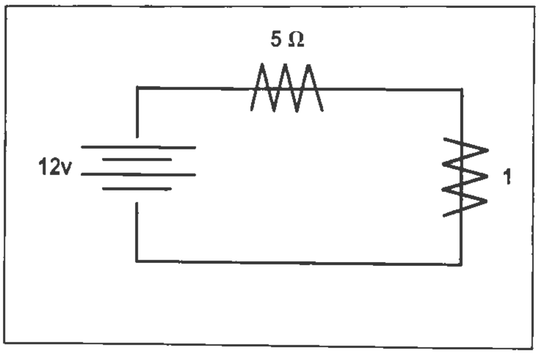
VOLTAGE DROP

ED = I x R

(Voltage drop does not affect parallel circuits)

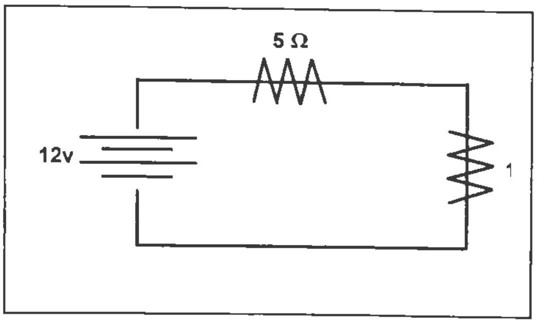
SERIES CIRCUIT

1. Current remains constant.
2. R^t = Sum of all resistors.
3. $E = I \; x \; R$



PARALLEL CIRCUIT

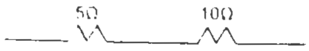
1. Current changes, and voltage remains constant. *(Parallel circuits do not experience voltage drop)*
2. Current follows the path of least resistance.
3. R^t is always less than the smallest resistor.
4. $R^t = \frac{R^1 \; x \; R^2}{R^1 + R^2}$

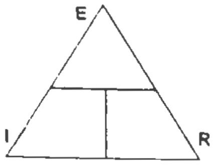


Basic Electricity - Practice Problems

(Solve the below problems using the given information and Ohm's law, show your math)

Series Circuit

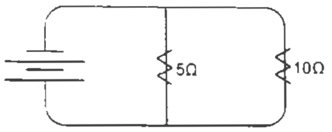


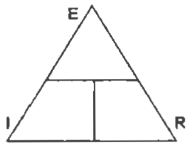


Known information: **0.8 Amps**

Find the voltage: ___________

Parallel Circuit

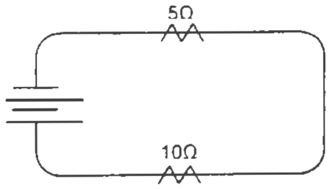


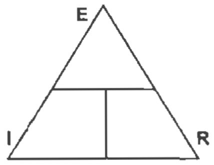


Known information: **7.2 Amps**

Find the voltage: ___________

Voltage Drop





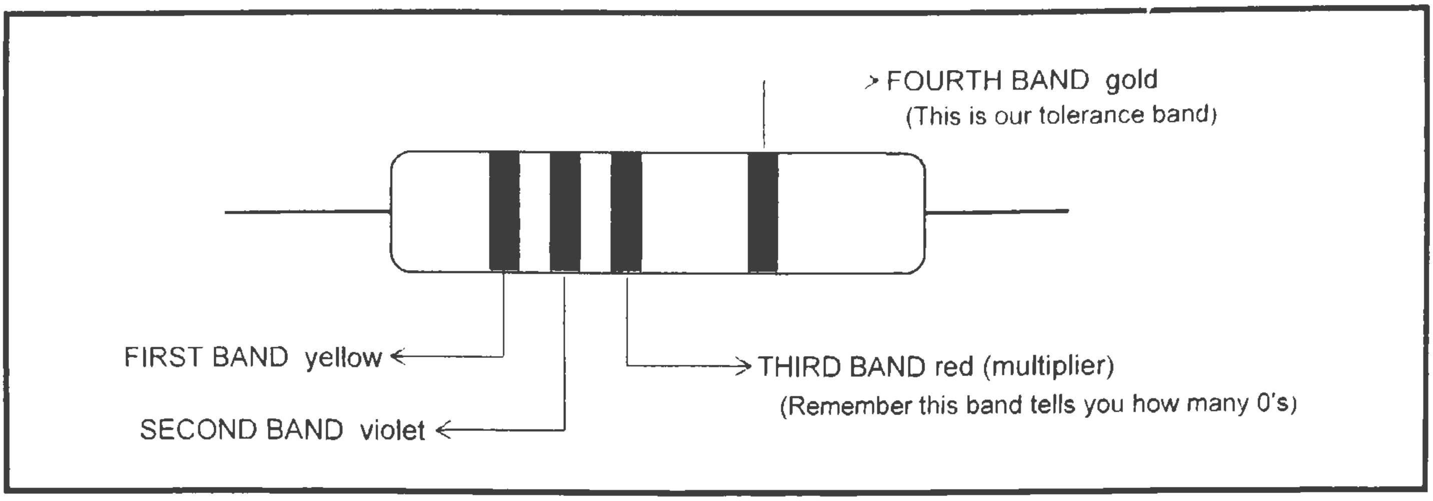
ED = I x R

ED = ____x 5Ω

ED = ____x____

Known information: **12 Volts** Find the Voltage drop after R1: ______ Find the Voltage drop after R2: ______

Use the color code chart and a multi-meter for checking resistors; you can use the General Handbook FAA-H-8083-30A or the Red Bakers Handbook.


FOURTH BAND gold
(This is our tolerance band)
FIRST BAND yellow
SECOND BAND violet
THIRD BAND red (multiplier)
(Remember this band tells you how many 0's)

First Band...is 4 (yellow) *Second Band* is ...7 (violet) *Third Band* the multiplier ...is 2 (red) *Fourth Band*...±5% (gold)

The resistor value is equal to 4,700Ω ±5%

To determine the ± range (Tolerance)...

1. Multiply 4,700 x 5% (5% = 0.05)
   4,700x 0.05 = 235
2. Add 235 to 4,700Ω
   4,700 + 235 = 4,935Ω
3. Subtract 235 from 4,700Ω
   4,700 – 235 = 4,465Ω

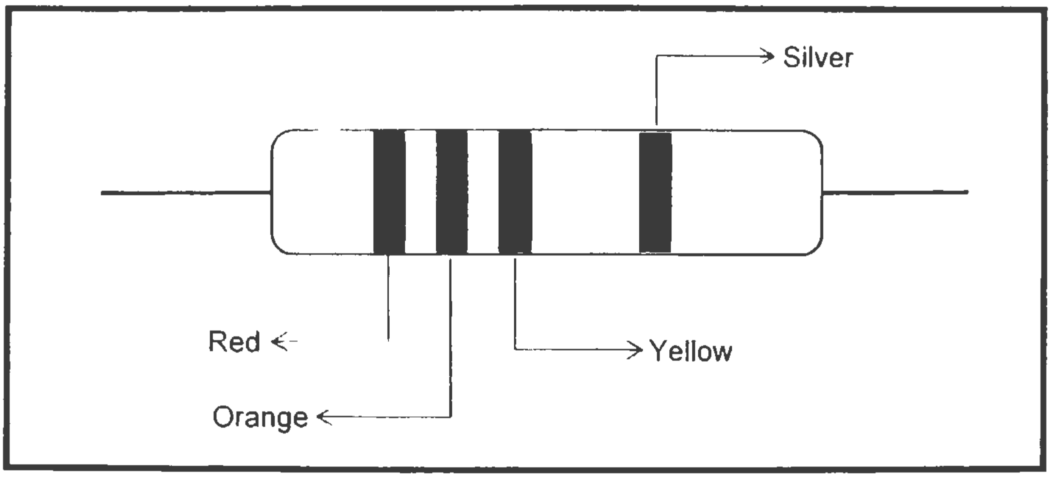
The way to write this down for the examiner would be

4,700Ω ±5% and the range is 4,465Ω to 4,935Ω

When checking this resistor with a multi-meter, if the resistance falls between the above ranges, the resistor is good.

Resistor check practice

Using the below resistor, and the given color bands, perform the required steps in order to determine the acceptable range of resistance.



1st band __________

2nd band __________

3rd band __________

4th band __________

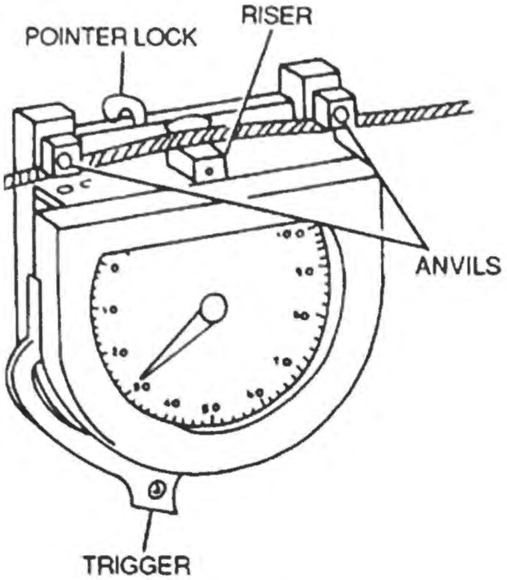
SHOW ALL MATH

Total resistance and the tolerance range:

____

Cable Tension

Correct cable tension can be found in the aircraft maintanance manual. The cables tension is checked with tensiometers and adjusted using turnbuckles.



1. The tensiometer must have the proper riser installed for the cable size being checked.
2. The cable is slipped between the riser and two anvils.
3. The trigger is closed against the housing, giving a reading on the tensiometer, which must be translated using the supplied chart.
4. The tensiometer should be installed at least 6" whenever possible **from any turnbuckles, fairleads or pulleys.**
5. It is preferred to install the tensiometer in the middle of the longest section of control cable.

Cable Tensiometer

CABLE TENSION (lbs.)	RISERS						
	#1	#1	#1	#2	#2	#3	#3
	CABLE DIAMETER (in)						
	1/16	3/32	1/8	5/32	3/16	7/32	1/4
10	8	10	12	--	--	--	--
20	14	18	21	15	22	--	--
30	21	28	29	20	28	30	40
40	27	33	38	25	35	34	47
60	38	46	52	34	45	46	56
80	47	58	65	41	54	54	66
100	57	67	78	50	64	61	74
120	--	--	--	58	71	68	84
150	--	--	--	67	83	79	93

Gauge S/N: 37113 Gage ID: DBA-077

1. If the examiner wants you to measure a 1/8" cable, which riser will you need?

   ____

2. If are measuring a 7/32" cable, which riser is required? __________

3. When measuring a 3/32" cable the tensiometer reads 46, what is the cable tension? __________

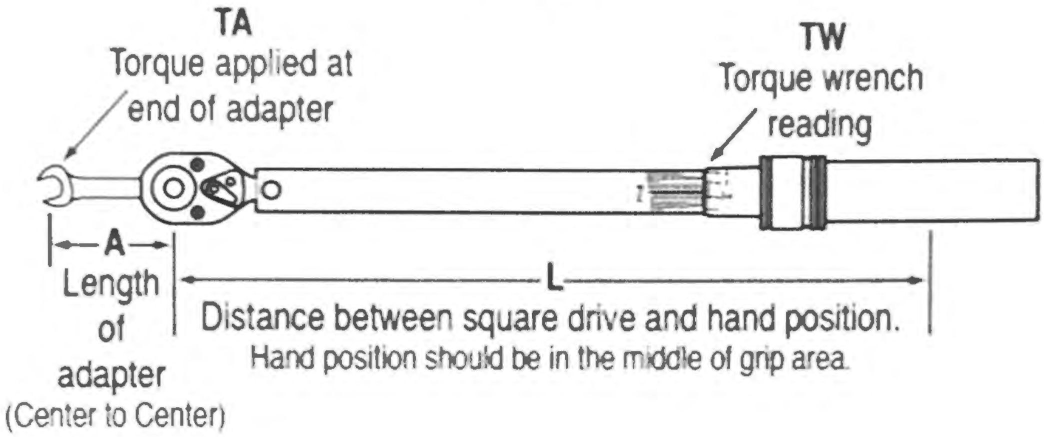
4. The tensiometer reads 14 on a 1/16" cable, what is the cable tension? __________

5. If the examiner wants a cable to have a tension of 100lbs, on a 3/16" cable, what should the tensiometer read? _________

Torque Wrench

Calculate the following torque wrench problem involving the use of an adapter or extension. (*Refer to AC43.13-1B Page 7-8, Figure 7-2 for the formulas*).

$$\text{Formula: } \frac{TA \times L}{L + A} = TW$$


TA
Torque applied at end of adapter
TW
Torque wrench reading
A
Length of adapter
(Center to Center)
L
Distance between square drive and hand position.
Hand position should be in the middle of grip area.

TA = Required applied torque = 100 ft-lbs.

L = Length of torque wrench = 12.25"

A = Adapter length = 9"

How many inch-pounds of torque would be required? Show all work below.

A landing gear trunnion nut requires a torque of ***416 in-lbs.*** To reach the nut, a 4" straight adapter must be used on a 12' torque wrench. How many ***ft-lbs.*** will be indicated on the torque wrench when the required torque of the nut is reached? Show all your work.

Answer: ____________________

Rivet Part Number and Layout

Rivet part number: **AN470AD-4-4**

AN	Identifies the "standard" of the rivet. (Air Force/Navy)
470	Identifies the head type of the rivet.
AD	Identifies the alloy of the rivet.
-4	Identifies the diameter of the rivet. (Measured in 32nds of an inch)
-4	Identifies the length of the rivet. (Measured in 16ths of an inch)

Note: **BOLT diameter is measured in 16ths on an inch and **BOLT** length is measured in 8ths of an inch**

Rivet Diameter and Length

Part of your rivet project may include determining diameter and length of rivet that should be used to join two pieces of metal. **You must show your work, including formulas.**

Review the following example of how your work should look for your examiner if you were joining **two** pieces of metal, **both with a thickness of 0.020."**

D = 3 x the thickest sheet

= 3 x 0.020

= 0.060

= 0.060 x 32

$= \frac{1.92}{32} = \frac{2}{32}$ (remember to always round up)

Simplify the fraction by dividing the numerator by the denominator.

2 ÷ 32 = 0.0625

L = grip + (1.5 x D)

= 0.040 + (1.5 x 0.0625)

= 0.040 + 0.09375

= 0.13375 x 16

$= \frac{2.14}{16} = \frac{2}{16}$ (use the .5 rule for rounding)

Layout Review

Minimum EDGE distance--------------------------------2D (2x diameter of the rivet)

Maximum EDGE distance--------------------------------4D (4x diameter of the rivet)

Minimum rivet row spacing (single row) -------------3D (3x diameter of the rivet)

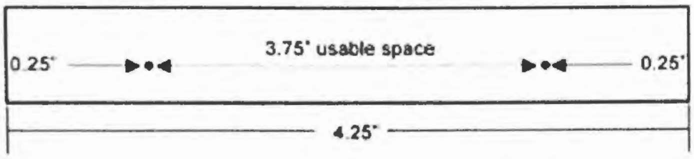
Minimum rivet spacing (double row) -----------------4D (4x diameter of the rivet)

Steps for rivet layout

1. Determine the **diameter** of the rivet to be used.
2. Determine the **length** of the rivet to be used.
3. Determine the **edge distance** to be used and plot the edge rivets.
4. Calculate how much **usable space** is left by taking your starting space minus your edge distance.
5. Determine the **spacing** to be used.
6. Take the **usable space and divide it by the spacing.** (Important: This will give you the number of spaced you have between the edge rivets, not the number of rivets.
7. Take this number of spaces and **subtract 1** (if a square or rectangle shape). This will give you the number of rivets that can be used between the edge rivets.
8. Add this number to the edge rivets for the total number of rivets.

Example of Rivet Layout Problem

A sheet metal repair is to be made using two 4.25" pieces of 0.032" thick aluminum riveted together. How many rivets are required for a single row of rivets if using minimum edge distance and minimum spacing"



1. D = 3 x thickest sheet
= 3 x 0.032
= 0.096 x32 (for 32nds)
= 3.072 (round up to 4)
= $\frac{4}{32}$ diameter = **0.125**

2. Edge distance = 2 x D
= 2 x 0.125
= **0.25** (from BOTH edges = 0.5 total)

3. Plot edge rivets in order to determine usable space.

4. Usable space = 4.25 – 0.5 = **3.75 inches.**

5. Spacing = 3 x D
= 3 x 0.125
= **0.375**

6. $\frac{\text{3.75 inches of usable space}}{\text{0.375 inch spacing}}$ = 10 **Spaces**

7. 10 spaces – 1 = 9 **Rivets**

8. 9 rivets + 2 edge rivets = **11 total rivets**

Find the diameter and length of the rivet for the following problems.

Two sheets of material, one is 0.032" and the other is 0.024"

D= L =
= =
= =
= =
= =

Two sheets of material, one is 0.064" and the other is 0.020"

D = L =
= =
= =
= =
= =

Two sheets of material, one is 0.045" and the other is 0.032"

D = L =
= =
= =
= =
= =

Rivet layout practice

Determine how many rivets would be required to attach a 10" x 5" plate, 0.032" thick, to a piece of material with same thickness.

Use: Minimum **edge distance of 2D**, for **single row spacing use 4D**. Also, calculate the length of the required rivet.

1. Find the rivet diameter
2. Find the edge distance.
3. Plot the edge rivets. (All four corners)
4. Calculate usable space for all four sides.
5. Calculate rivet spacing.
6. Take the usable space and divide it by the spacing.
7. Find the total number of rivets.
8. Calculate the length of the rivet.

Sheet metal bending review

Sheet metal bending is a process of forming metal for aircraft application. When bending sheet metal, many factors must be considered in determining how the bend can be made, and where to start it. However, the most important considerations for a single bend in sheet metal are ***Setback (SB), Sight Line (SL), Bend Tangent Line (BTL), and the Mold Line Dimension (MLD).*** The entire sheet metal bending process is laid out in the *FAA-H-8083-31 Aviation Maintenance Technician Handbook,* Volume One, starting on page 4-59

Definitions

Thickness (T): ----------------------------The thickness of the metal.

Radius (R): --------------------------------The radius of the bend is where the arc that is formed as the metal is bent.

Setback (SB): ----------------------------The distance the jaws of a brake must be setback from the mold line to form a bend.

Flat: --The portion of a part that is not included in the bend.

Mold Line Dimension (MLD): --------The dimension a part would have if its corners had no radius. This is the length of the bend.

Bend Tangent Line (BTL): --------------The location at which the metal starts to bend and the line at which the metal stops curving.

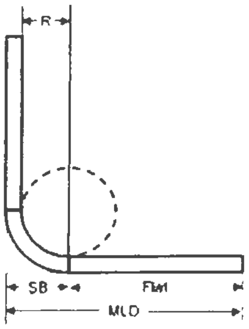
Sight Line (SL): --------------------------The layout line that is set directly under the edge of the radius bar.

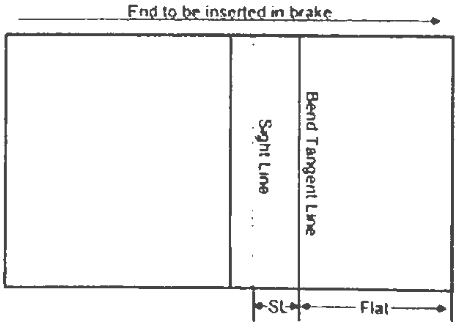
Required Formulas:

$$SB = R + T$$

$$Flat = MLD - SB$$

$$SL = BTL + R$$





To create only on 90° bend in a piece of sheet metal, use the following basic steps.

1. Sketch the material on paper to scale.
2. Identify the **R**adius of the bend, **T**hickness of the metal, **M**old **L**ine **D**imension, and which end of the metal will go into the brake.
3. Calculate **S**etback.
4. Calculate **F**lat of the end to be formed.
5. Use the **F**lat to sketch the **B**end **T**angent **L**ine on the layout.
    a. The bend tangent line is located by measuring in the distance of the flat from the end of the metal. *
6. Calculate the **S**ight **L**ine.
7. Sketch the **SL** on the layout.
8. Insert the metal into the brake by placing the **S**ight **L**ine directly under the end of the radius bar.
9. Clamp the metal into place.
10. Bend to desired angle.

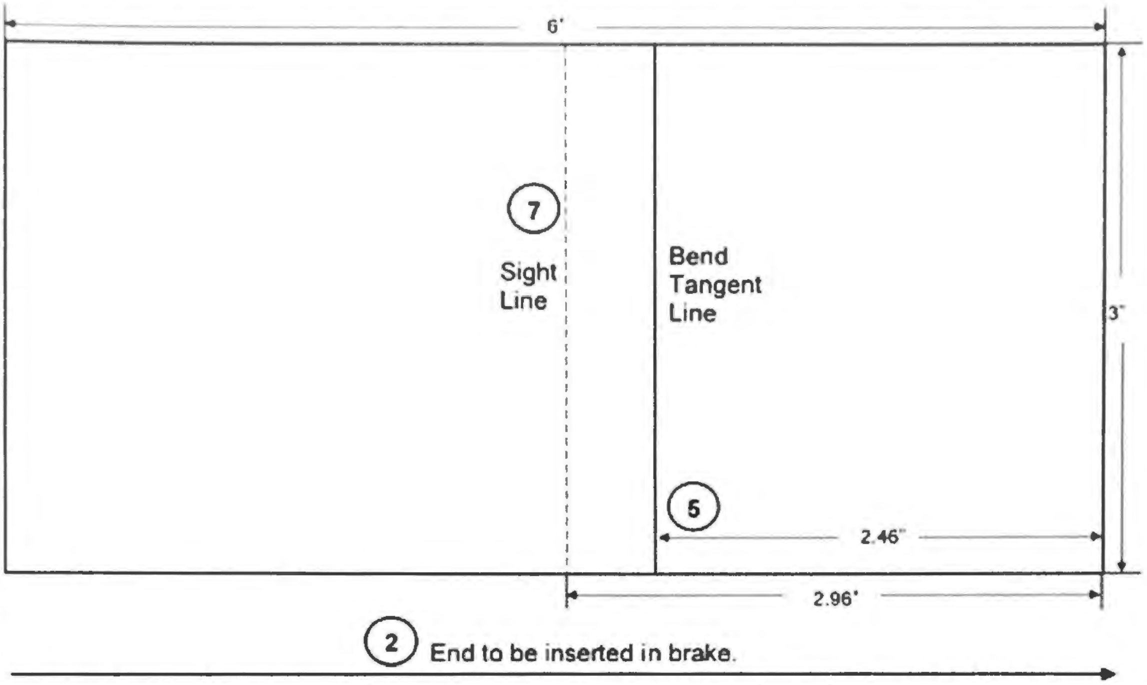
Always be sure to bend against the grain of the metal*

Sheet Metal Bending Review

Example 1:

The Examiner gives you a piece of metal that is 6" long by 3" wide, and 0.040" thick. He wants you to make a 3-inch flange using a 90° bend on a ½" radius bar.

Step 1 Sketch the metal to scale, and determine the end that can be inserted into the brake easiest.



Step 2: Determine radius, thickness, mold line dimension, and the end of the metal that will go into the brake.

$R = 0.50"$

$T = 0.040"$

$MLD = 3"$

Step 3: Determine setback.

$$SB = R + T$$
$$SB = 0.5" + 0.040"$$
$$SB = 0.54"$$

Step 4: Find the flat line dimension (flat) of the end to be formed.

$$Flat = MLD - SB$$
$$Flat = 3" - 0.54"$$
$$Flat = 2.46"$$

Step 5: Using the flat line dimension, sketch the bend tangent line on the layout.

Step 6: Calculate the sight line.

$$SL = BTL + R$$
$$SL = 2.46" + 0.50"$$
$$SL = 2.96"$$

Step 7: Locate the sight line by measuring in from the bend tangent line.

After completing the steps above, you will have to transfer your sketch to the actual metal. When bending the metal be sure to insert the correct end into the brake and use the sight line to line the bend up with the edge of the radius bar. Then clamp the metal in place and finally bend to the desired angle.

Sheet Metal Bending Review

Example 2:

The Examiner gives you a piece of metal that is 4" x 2" and 0.032" thick. He wants you to create a 90° bracket using a 1/8" radius bar. The leg should be 2"

Step 1 Sketch the metal to scale, and determine the end that can be inserted into the brake easiest.

Step 2: Determine radius thickness, mold line dimension, and the end of the metal that will go into the brake.

Step 3: Determine setback.

$SB - R + T$

$SB =$

$SB =$

Step 4: Find the flat line dimension (flat) of the end to be formed.

$Flat = MLD - SB$

$Flat -$

$Flat =$

Step 5: Using the flat line dimension, sketch the bend tangent line on the layout.

Step 6: Calculate the sight line.

$SL = BTL + R$

$SL =$

$SL =$

Step 7: Locate the sight line by measuring in from the bend tangent line.

After completing the steps above, you will have to transfer your sketch to the actual metal. When bending the metal be sure to insert the correct end into the brake and use the sight line to line the bend up with the edge of the radius bar. Then clamp the metal in place and finally bend to the desired angle.

Sheet Metal Bending Review

Example 3:

The Examiner wants you to make a 90° bend in a 5" x 3" piece of metal that is 0.064" thick. The bend radius will be ¼" and the bend needs to be in the middle of the 5" length.

Step 1	
Step 2:	**Step 5:**
Step 3:	**Step 6:**
Step 4:	**Step 7:**

After completing the above steps:

1. Which end of the metal should be inserted in the brake?

   ____

2. What's used to align the metal so the bend will be in the correct place?

   ____

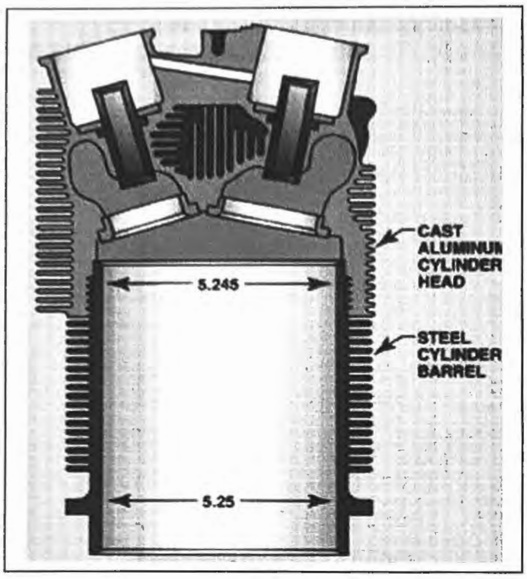
3. Where is the sight line aligned too?

   ____

Reciprocating Engine Review

Cylinders, Pistons, Valve train etc....

The cylinder or jug consists of two parts: The head, made of aluminum and the Barrel, made of steel.



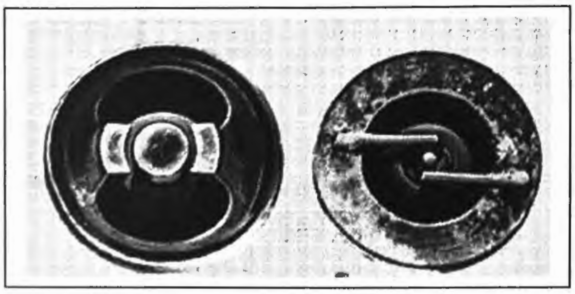
The cooling fins increase the surface area to transfer heat more easily into the air stream flowing through them. The cylinder head cooling fins are made of **CAST aluminum** making them very brittle and easily broken. If bent, they should **NEVER** be straightened unless they are touching. In this case, only straighten the fins enough to not be touching. Other allowable repairs include, smoothing out rough edges and stop drilling cracks, if they can be reached. **NOTE**: There will be more cooling fins around the exhaust port. ***More heat requires more cooling.*** Also, notice the difference in the size of the two ports. The exhaust port is usually smaller than the intake port. The intake port has a larger opening to help promote better volumetric efficiency. Notice that the cylinder barrel is narrower at the top. This is called **Choked** or **Tapered**. The purpose is *thermal expansion.* At operating temperatures, the cylinder expands slightly at the top. Measurement of the bore (diameter) is accomplished with either a dial indicator or a Telescoping gage and caliper. Use the engine maintenance manual for depth into the cylinder, orientation of the measuring instrument and number of measurements to be taken.

Types of cylinders and their paint markings: The paint markings are usually located on the cooling fins between the pushrod tubes (sometimes around the lower flange area). The first cylinders were made of steel (no paint marking). Then a process known as nitride (marked with blue paint) was developed, which is a metal surface hardening process. Today, most cylinders are plated with chrome (orang paint). Oversized cylinders are marked with green (0.010" over) or yellow (0.020" over). Steel and nitride cylinders must be honed. This is a process the scratches the cylinder wall in a crisscross pattern to hold oil on the cylinder walls. This film of oil is necessary for cleaning, colling, lubrication, and sealing. Chrome cylinders do not require honing. During the chrome process, the chrome becomes cracked. The surface of the chrome looks crazed and these cracks at what hold the oil to the cylinder walls.

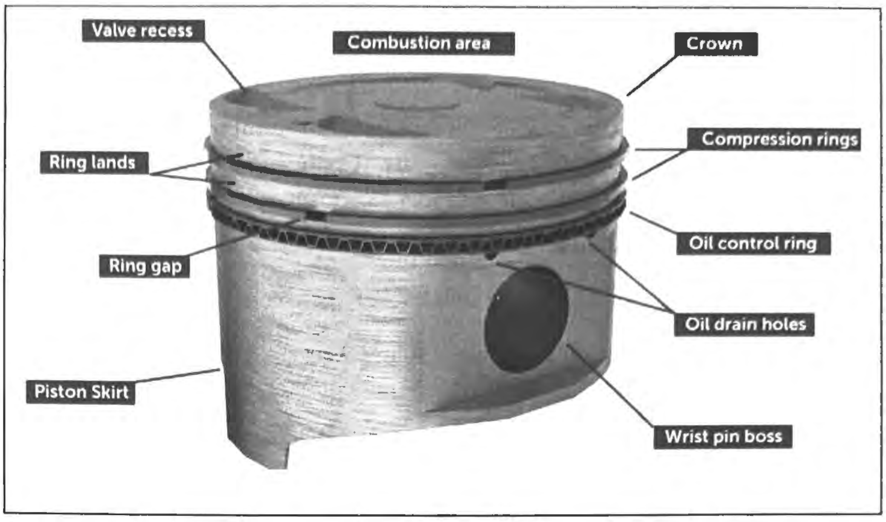
The spark plugs: There are two sparks plugs per cylinder and two magnetos per engine. One magneto fires all of the top plugs on one side and the bottom plugs on the other side. The other magneto fires the alternate plugs. This provides a faster burn of the fuel mixture. During an engine magneto run-up, turning off each magneto, in turn, should result in a slight drop on RPM each time.

Spark plug rotation: Swap top to bottom, next IN FIRING ORDER!!!

There are two types of plugs commonly used in recip. engines. The first engines built used the **standard** reach plugs (also known as short reach). Later, as engine development progressed, higher compressions as well as higher temperatures were being reached. A spark plug with more threads was required. These are commonly known as long reach spark plugs. Cylinders using long reach plugs have a yellow paint mark above the spark plug hole on the pushrod side of the cylinder. **Spark plug electrode:** Two types commonly used are the **massive and fine wire**. Notice, that it is the center electrode that is either massive or fine. Spark plug fowling occurs when 1) Oil soaks the electrode, 2) carbon builds up from too rich a fuel mixture and 3) lead builds up (white hard crust) from a high RPM run before the engine warms up properly.



The Piston and Piston Rings



Pistons are generally made of aluminum. The rings are made of cast metal, usually steel. The rings can be either plain steel or chrome plated. The top of the piston is the face whether its domed, flat or concave. The first two grooves are for the compression rings. There may be more than two but two is the minimum. The third groove, in this diagram would be for the oil control ring. The lower groove (not pictured here) is the scraper ring. The name of each ring describes its purpose. The compression rings are for compression. Remember, the ring gaps must be staggered during installation. If the gaps become aligned, the piston may not hold the required compression. The oil control ring does just that. It leaves oil on the up stroke and removes it on the down stroke. Oil control rings also have holes or gaps to allow oil to pass through the weep holes. These weep holes channel oil to the wrist pin for lubrication as well as aid in cooling in inner portion of the piston head. The scraper ring, installed only on extended skirts, aids the oil control ring by leaving a film of oil on the way up and scrapes it off on the way down. It also helps prevent hydraulic lock on inverted cylinders such as the lower cylinders of a radial engine. The scraper ring also stabilizes the piston inside the cylinder and prevent piston slap

The wrist pin also known as the connecting rod pin is made of hardened steel. Most are free floating with aluminum end caps to prevent scaring the cylinder wall.

The valve train consists of the cam shaft, the lifters or followers, the pushrods, the rocker arms the valves and the valve springs. Lifters are generally hydraulic. This is to maintain valve clearance. Valve clearance is measured from the rocker arm to the valve stem. Many exhaust valve stems are filled with a metallic sodium (MS). MS melts at a low temperature (208°F) allowing heat to be drawn up from the valve face into the stem for better heat dissipation. Pushrods have a small hole through the center to provide lubrication and cooling of the **rocker box (the upper portion of the cylinder head under the valve cover).** The oil returned to the sump either through the pushrod tube or a return line, depending on the configuration of the engine.

The valve springs: Most of today's engines are equipped with 2 or 3 spring per valve. This is to prevent **"valve spring surge."** Metal vibrates at specific harmonics. The vibration is specific to the metal and its thickness. Using different metal thickness for the two springs each vibrates at a different frequency preventing the valves from floating. A second spring is also necessary for redundancy or a backup, in-case one breaks.

Illustrated Parts Manual Search

Locate the following information from the Lycoming O-320-D1A illustrated parts manual.

	Index Number	Part Number	Quantity Required
Screw			
Low pressure fuel pump			
Fuel pump gasket			

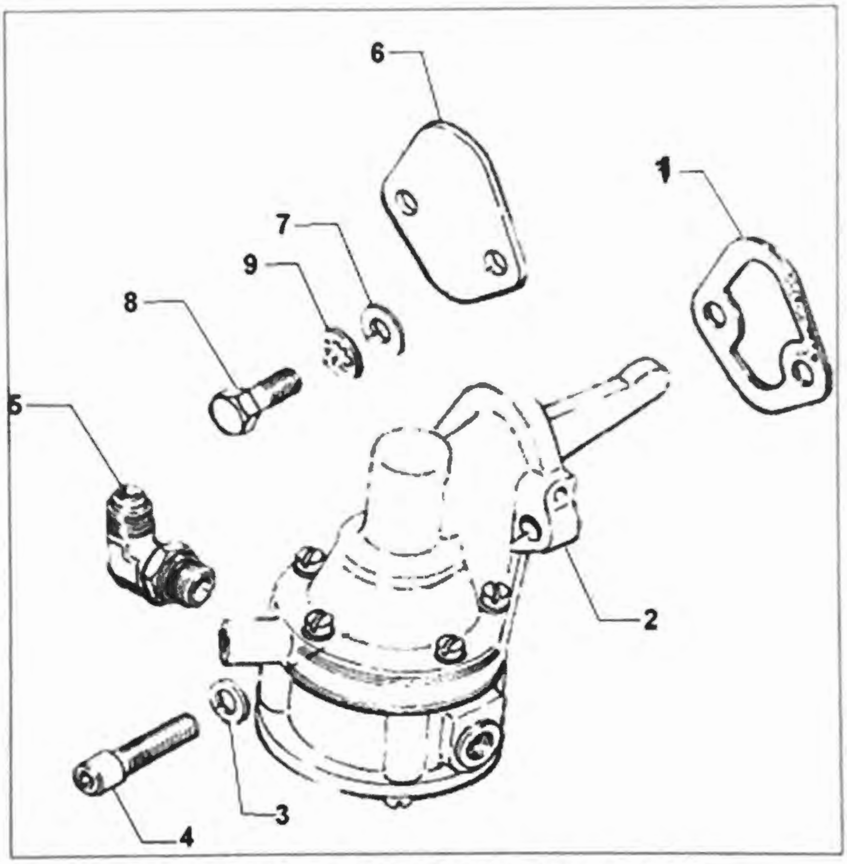
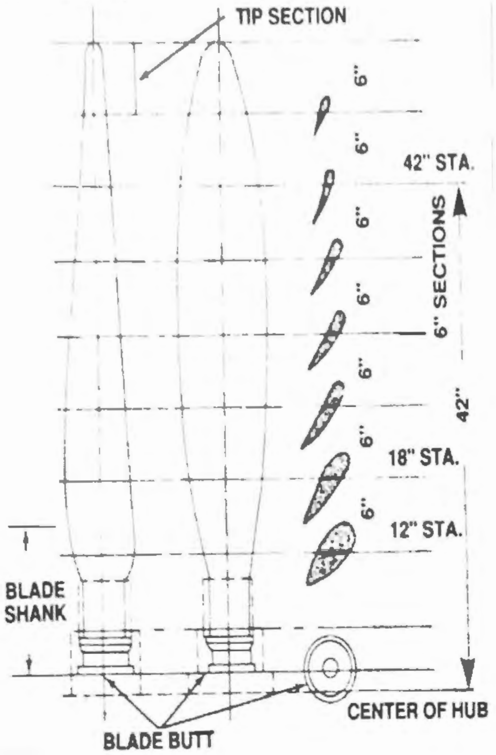


Figure 13. FUEL PUMP ASSEMBLY AND ATTACHING PARTS

FIG. & INDEX	PART NUMBER	DESCRIPTION	QUANTITY PER ASSY.											
			B2B	B2C	B3B	D1A	D1D	D1F	D2A	D2B	D2C	D2G	D2J	D3G
1	60096	GASKET, Fuel pump	1	1	1	1	1	1	1	1	1	1		1
2	LW-15472	FUEL PUMP, Low pressure, dual diaphragm (6441271)	1	1	1	1	1	1	1	1	1	1		1
	LW-16335	FUEL PUMP, Low pressure, dual diaphragm (6441452)					1							
3	STD-33	WASHER, 3/8 plain	2	2	2	2	2	2	2	2	2	2		2
4	STD-1882	SCREW, 3/8-16 x 1-9/32 long, socket hd., dr. hd.	2	2	2	2	2	2	2	2	2	2		2
5	72377	ELBOW, 3/8 tube, 90° (inlet)					1							
6	65098	COVER, fuel pump	1	1										
7	STD-33	WASHER, 3/8 plain	2	2										
8	LW-38.75	BOLT, 3/8-16 x ¾ long, hex. hd.	2	2										
9	STD678	WASHER, lock	2	2										

Propellers

Your examiner may ask you to measure a prop blade station and or file a minor nick from the leading edge of the prop. The diagram below gives the basics for measuring prop blade stations without the blades attached to the prop.

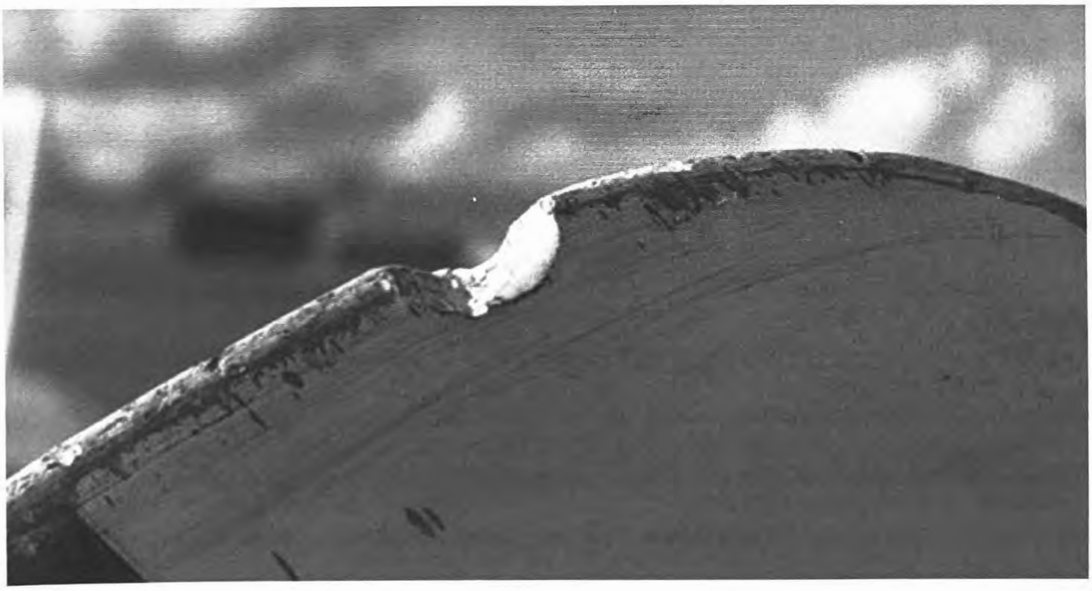


If the prop blade is not attached to the prop hub in the manual, find the measuring point on the prop (usually the root flange). The manual will also tell you how far that is to the center of the hub.

FILING OUT A NICK

The photo below illustrates why we must remove nicks via dressing or blending in the leading edge of the prop. Left untreated, the nick creates a stress point at which the centrifugal force of the spinning prop pulls enough to begin cracking at the "V" of the nick. Blending the nick spreads the stress point over a much greater area.

1. Start with a rat tail file, filing perpendicularly to the blade leading edge, rounding out the point of the nick.
2. Once the point of the nick has been blended out, change to a half round file.
3. Now, parallel to the leading edge begin blending with progressively finer grits of sandpaper and emery cloth.



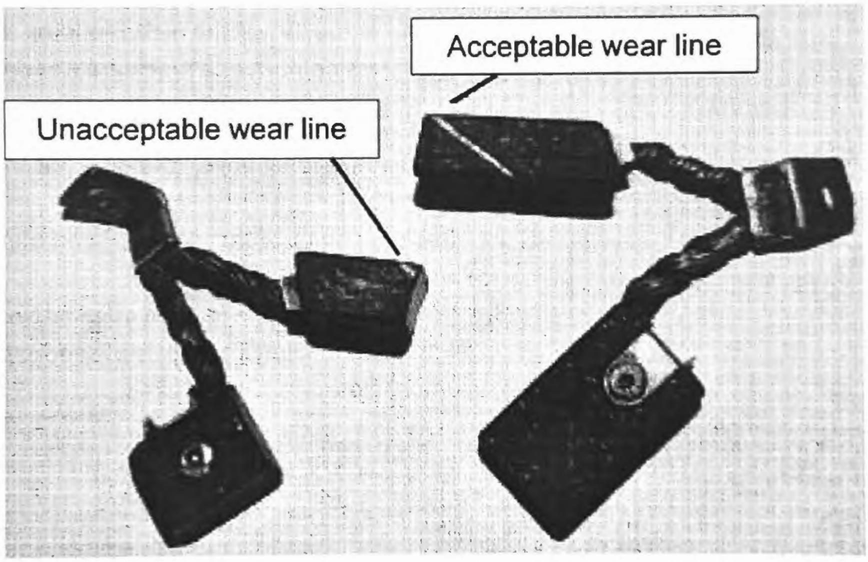
Starter-Generator Brushes

Checking carbon brushes for wear and or damage:

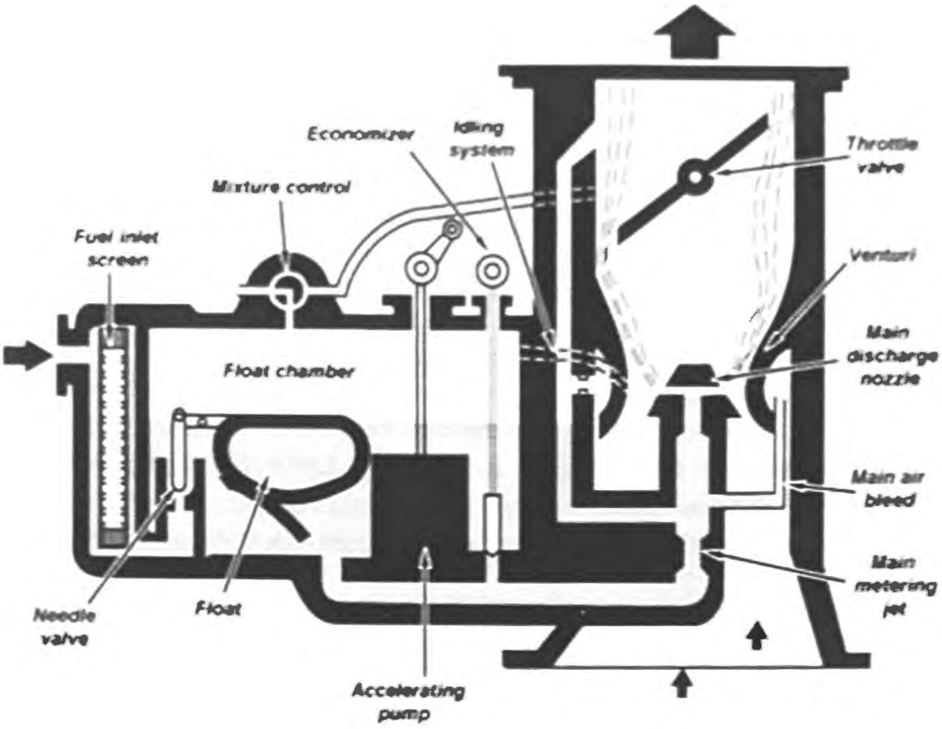
Depending on the type of starter or generator or starter-generator, you will need to expose the brushes and commutator. Some generators have a metal band around one end, some starter/generators have a 4-screw cover. Observe how everything is removed (including any safety wire) you will be reinstalling afterwards.

As a rule, brushes must be replaced at half their original length. Most brushes have a wear line, either diagonal, or straight across the halfway point. The end of the diagonal or the absence of the straight line indicates that the brush is worn down and must be replaced. **NOTE**: Some manufacturers require comparing with the new brushes to determine wear. Always reference the appropriate maintenance manual.

If only one brush is worn or damaged all brushes must be replaced. Replacing only one brush would cause a higher spring tension and undue side load on the armature bearings.



Float-Type Carburetor



Principle of Operation: Low pressure differential offered by the venturi to incoming air.

Throttle Valve: Directly regulates the flow of **air** through the carburetor, **indirectly** regulates the flow of **fuel.**

Accelerator pump: Compensates for rapid throttle movement… hesitates hesitation.

Economizer valve: Automatically richens the fuel mixture at high power settings. Opens at 70-90% of full throttle travel.

Idling System: Fuel passageway incorporated to discharge fuel at idling speeds.

Main drawback: Carburetor icing caused by cooling due to expansion of air and evaporation. Compensated for by ducting heated air into the carb.

Three Types of Icing

Evaporation Icing: Formed due to the decrease in air temperature resulting from the evaporation of fuel.

Throttle Ice: Formed on the rear side of the throttle, usually the throttle is in a partially closed position.

Impact Ice: Formed from water droplets resent in the atmosphere.

A float-type carburetor consists of six subsystems that control the quantity of fuel discharged in relation to the flow of air delivered to the engine cylinders. These systems work together to provide the engine with the correct fuel flow during all engine operating ranges.
The essential subsystems of a float-type carburetor are:

1. Float chamber mechanism system
2. Main metering system
3. Idling system
4. Mixture control system
5. Accelerating system
6. Economizer system

Float Chamber System

A float chamber is provided between the fuel supply and the main metering system of the carburetor. The float chamber, or bowl, serves as a reservoir for fuel in the carburetor. This chamber provides a nearly constant level of fuel to the main discharge nozzle which is usually about 1⁄8" below the holes in the main discharge nozzle. The fuel level must be maintained slightly below the discharge nozzle outlet holes to provide the correct amount of fuel flow and to prevent fuel leakage from the nozzle when the engine is not operating.

The level of fuel in the float chamber is kept nearly constant by means of a float-operated needle valve and a seat. The needle seat is usually made of bronze. The needle valve is constructed of hardened steel, or it may have a synthetic rubber section which fits the seat. With no fuel in the float chamber, the float drops toward the bottom of the chamber and allows the needle valve to open wide. As fuel is admitted from the supply line, the float rises (floats in the fuel) and closes the needle valve when the fuel reaches a predetermined level. When the engine is running and fuel is being drawn out of the float chamber, the valve assumes an intermediate position so that the valve opening is just sufficient to supply the required amount of fuel and keep the level constant.

With the fuel at the correct level (float chamber), the discharge rate is controlled accurately by the air velocity through the carburetor venturi where a pressure drop at the discharge nozzle causes fuel to flow into the intake airstream. Atmospheric pressure on top of the fuel in the float chamber forces the fuel out the discharge nozzle. A vent or small opening in the top of the float chamber allows air to enter or leave the chamber as the level of fuel rises or falls.

Main Metering System

The main metering system supplies fuel to the engine at all speeds above idling and consists of:

1. Venturi
2. Main Metering Jet
3. Main Discharge Nozzle
4. Passage leading to the idling system
5. Throttle Valve

Since the throttle valve controls the mass airflow through the carburetor venturi, it must be considered a major unit in the main metering system as well as in other carburetor systems. A typical main metering system is illustrated in Figure 3. The venturi performs three functions:

1. Proportions the fuel/air mixture
2. Decreases the pressure at the discharge nozzle
3. Limits the airflow at full throttle

e fuel discharge nozzle is in the carburetor barrel so that its open end is in the throat or narrowest part of the nturi. A main metering orifice, or jet, is placed in the fuel passage between the float chamber and the discharge ozzle to limit the fuel flow when the throttle valve is wide open.

ling System

With the throttle valve closed at idling speeds, air velocity through the venturi is so low that it cannot draw nough fuel from the main discharge nozzle; in fact, the spray of fuel may stop altogether. However, low pressure iston suction) exists on the engine side of the throttle valve. In order to allow the engine to idle, a fuel passageway is corporated to discharge fuel from an opening in the low-pressure area near the edge of the throttle valve. This pening is called the idling jet. With the throttle open enough so that the main discharge nozzle is operating, fuel does not flow out of the idling jet. As soon as the throttle is closed far enough to stop the spray from the main discharge ozzle, fuel flows out the idling jet. A separate air bleed, known as the idle air bleed, is included as part of the idling stem. It functions in the same manner as the main air bleed. An idle mixture adjusting device is also incorporated.

Mixture Control System

As altitude increases, the air becomes less dense. At an altitude of 18,000 feet, the air is only half as dense as is at sea level. This means that a cubic foot of space contains only half as much air at 18,000 feet as at sea level. An ngine cylinder full of air at 18,000 feet contains only half as much oxygen as a cylinder full of air at sea level.

The low-pressure area created by the venturi is dependent upon air velocity rather than air density. The action the venturi draws the same volume of fuel through the discharge nozzle at a high altitude as it does at a low titude. Therefore, the fuel mixture becomes richer as altitude increases. This can be overcome either by a manual or n automatic mixture control.

celerating System

hen the throttle valve is opened quickly, a large volume of air rushes through the air passage of the carburetor; the nount of fuel that is mixed with the air is less than normal due to the slow response rate of the main metering ystem. As a result, after a quick opening of the throttle, the fuel/air mixture leans out momentarily. This can cause e engine to accelerate slowly or stumble as it tries to accelerate.

To overcome this tendency, the carburetor is equipped with a small fuel pump called an accelerating pump. It onsists of a simple piston pump operated through linkage by the throttle control and a passageway opening into the ain metering system or the carburetor barrel near the venturi. When the throttle is closed, the piston moves back, nd fuel fills the cylinder. If the piston is pushed forward slowly, the fuel seeps past it back into the float chamber; if ushed rapidly, it sprays fuel in the venturi and enriches the mixture.

conomizer System

For an engine to develop maximum power at full throttle, the fuel mixture must be richer than for cruise. The dditional fuel is used for cooling the engine combustion chambers to prevent detonation. An economizer is ssentially a valve that is closed at throttle settings below approximately 60–70 percent of rated power. This system, ke the accelerating system, is operated by the throttle control.

A typical economizer system consists of a needle valve which begins to open when the throttle valve reaches a redetermined point near the wide-open position. As the throttle continues to open, the needle valve is opened urther and additional fuel flows through it. This additional fuel supplements the flow from the main metering jet rect to the main discharge nozzle.

Type Certificate Data Sheet / Aircraft Specification Number Review

Type certificate Data Sheets (TCDS) and Aircraft Specifications (AS) are FAA approved documents that provide information about aircraft, engines, and propellers. For example, the TCDS for a Cessna 172N will list information such as the approved engines, propellers, maximum weight, center of gravity range, number of seats, fuel and oil capacity, datum location, etc. If an aircraft was certified under an AS, a list of required equipment would also be provided.

Your DME will assign an aircraft for you to research using these documents. You may be given a paper copy of the document, or you may be researching from a CD-ROM program (IAapproach). The following will give you a general outline of how the TCDS and AS are formatted. As you research the assigned aircraft on the following pages you will notice that each document follows the same format.

Aircraft Specification Format

1. Model Selection **(Models are numbered using Roman Numerals)**
2. Specifications Pertinent to All Models
    - Datum
    - Leveling Means
    - CERTIFICATION BASIS **(gives the CAR or FAR the aircraft is certified under)**
    - Production Basis
    - Equipment Paragraph
3. Equipment List **(lists the required equipment for EVERY model)**
4. Notes **(NOTE 2 pertains to PLACARDS)**

Type Certificate Data Sheet Format

1. Model Selection **(Models are numbered using Roman Numerals)**
2. Data Pertinent to All Models
    - Datum
    - Leveling Means
    - CERTIFICATION BASIS **(gives the CAR or FAR the aircraft is certified under)**
    - Production Basis
    - Equipment
3. Notes **(NOTE 2 pertains to PLACARDS)**

Piper PA-22-150

Aircraft Specification Number: ___________

Datum Location: ____________

Engine (Make and Model): ____________________

Propeller: (Make and Model): ____________________

Are spacers required for this engine prop combination? ____________________________

Engine TCDS #: _________________________

Carburetor: _________________

Magnetos (list two types): ___________________

Spark plugs (List 2 brands and 2 of their part numbers): ____________________

Mitsubishi MU-2B-26A

TCDS Number: _______________

Engine (Make and Model – list 1): _________________________

How many approved propellers? _________________________

Fuel (list 2 types): _______________________________________

Datum: ____

Textron Beechcraft A60

TCDS Number: __________________

Rudder control surface movement: _________________________

Leveling means: ___________________________

Datum: ____________________

List 2 approved propeller hubs: ______________________________

Viking DeHavilland DHC-2 MK 1

TCDS Number: ______________________

Approved Engine: ______________________

Location of approved optional engines: ______________________________

Engine limits at takeoff: __________________________

How many approved propellers? _________________________

Datum: ______________________________

Pratt & Whitney Wasp Jr. SB-3

TCDS Number: _____________________

Carburetor (list 2): ____

Fuel type: ________________________________

Magnetos (list 2): ____

Timing: ___________________________________

Spark plugs (list 4): ____

Airworthiness Directive Research

List the **4 MOST RECENT ADs** issued for the assigned aircraft. Place an "X" in the appropriate column to indicate if the AD applies or does **NOT** apply to the given serial number for the aircraft.

Mitsubishi MU-2B-26A **Serial Number: 349SA**

AD Number	*Applies*	*Does NOT apply*

Beech Duke A 60 **Serial Number: P-147**

AD Number	*Applies*	*Does NOT apply*

Baron 58 (Beech Baron) **Serial Number: TH-1008**

AD Number	*Applies*	*Does NOT apply*

Viking DeHavilland DHC-2 Mk1 **Serial Number: 775**

AD Number	*Applies*	*Does NOT apply*

Search for the following ADs by the AD number

AD Number	*Acft Make*	*Subject*	*When compliance is due*
67-24-02			
80-11-04			
47-50-13			
50-17-02			

Additional information for review

1. Be able to identify various cockpit instruments and know their purpose:

Basic flight instruments

a. Airspeed indicator
b. Altimeter
c. Rate of Climb (vertical speed indicator)
d. Attitude indicator
e. Turn coordinator
f. Directional Gyro (Compass)

Basic engine instruments:

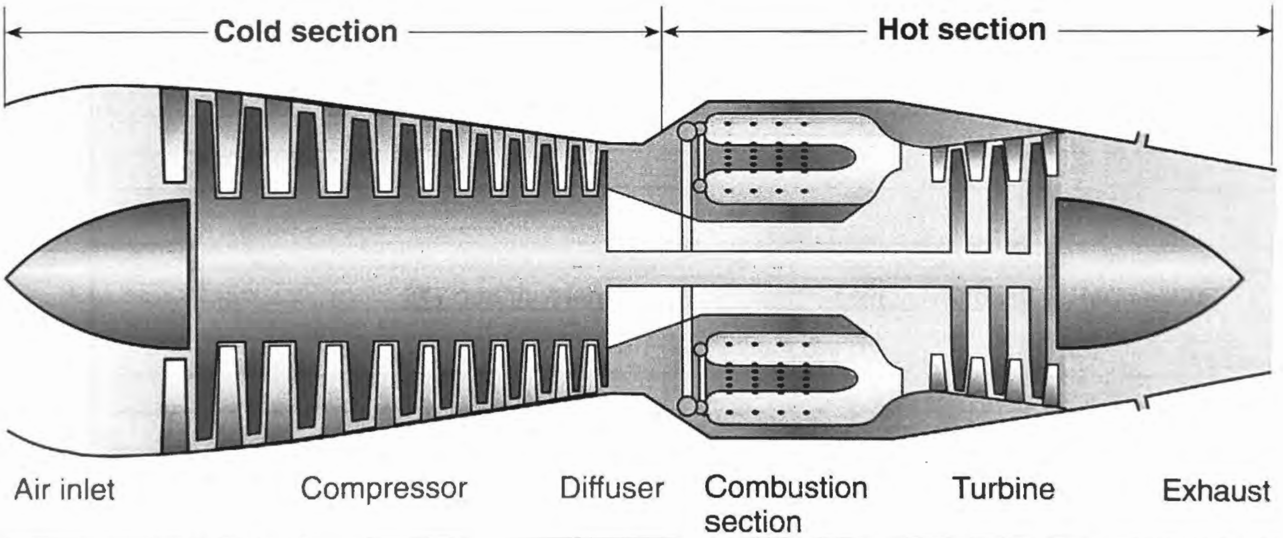
a. Tachometer
b. Fuel pressure
c. Oil temperature
d. Oil pressure
e. Cylinder temperature
f. Exhaust gas temperature
g. Manifold Pressure

2. Know what to look for if you are completing a visual inspection of the intake of a turbine engine. **Look for foreign objects, crack, nicks, gouges, and loose rivets.**

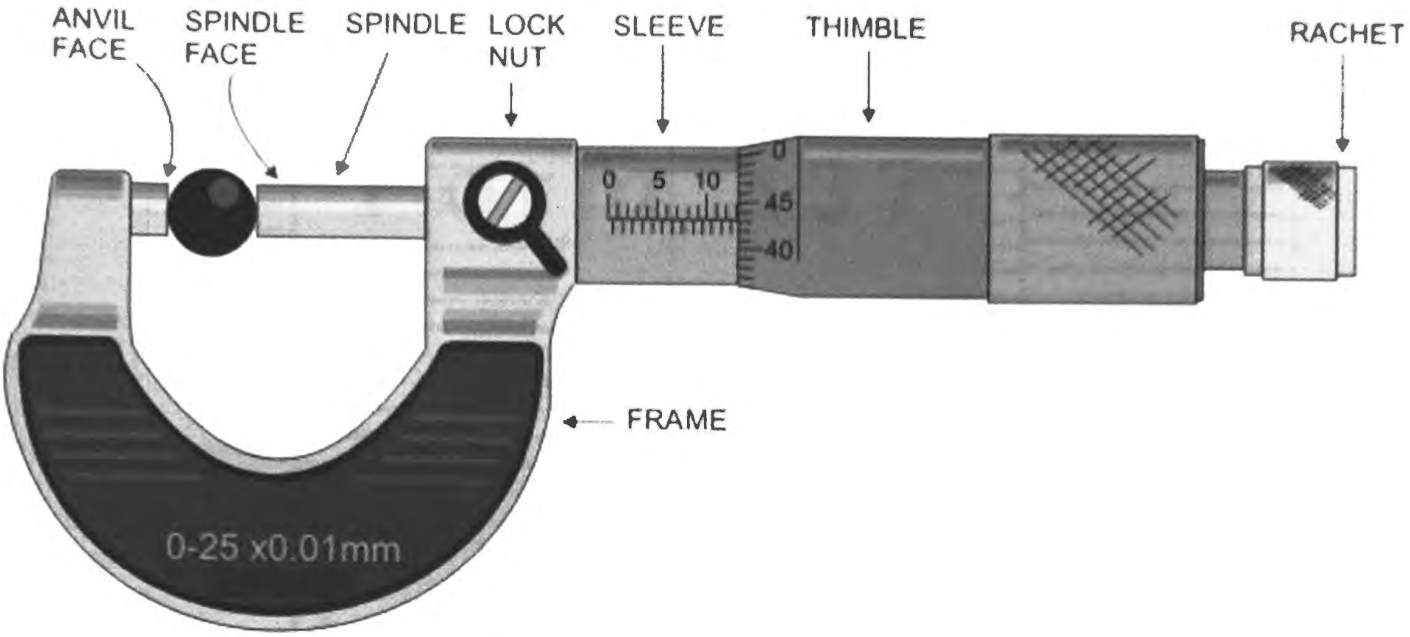
3. Know what to look for if you are performing a visual inspection of the exhaust area. **Look for hot spots, streaks, corrosion, alignment, leaks, bird nests and security.** Also, what type of marking tools are acceptable on the exhaust surfaces? **Chalk or India ink.**

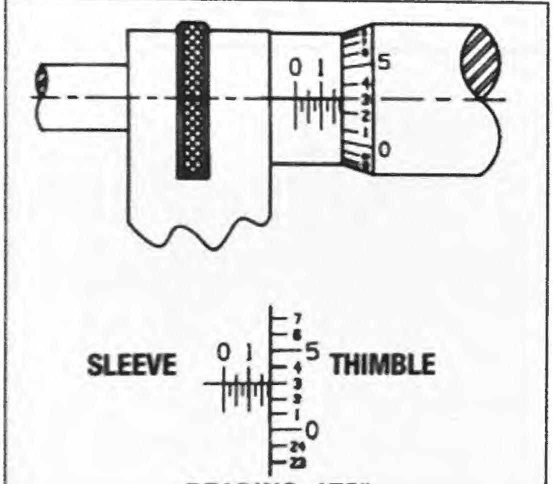
Turbine engine component labeling

Know this basic nomenclature and be able to label each item.



Micrometer reading





READING .178"

EXAMPLE:

The "1" line on sleeve is visible, representing	**.100"**
There are 3 additional lines visible, each representing .025" 3 x .025"	**= .075"**
Line "3" on the thimble coincides with the reading line on the sleeve, each line representing .001" 3 x .001"	**= .003"**
The micrometer reading is	**.178"**

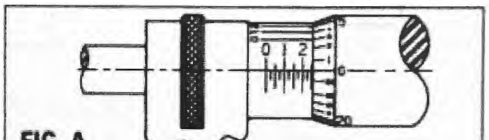
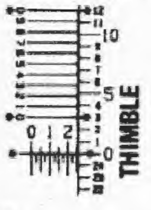
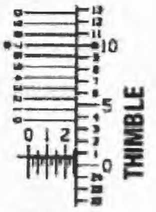


FIG. A



SLEEVE
FIG. B
Reading .2500"



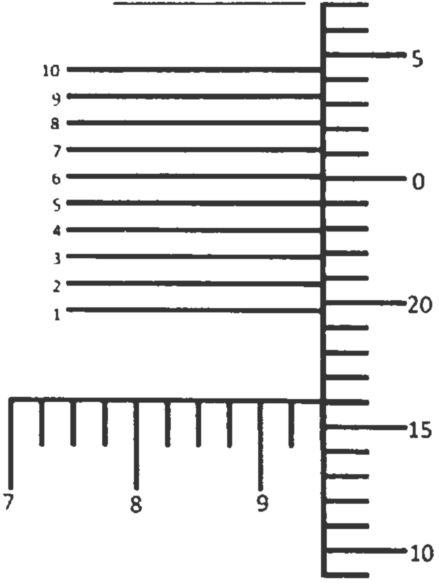
SLEEVE
FIG. C
Reading .2507"

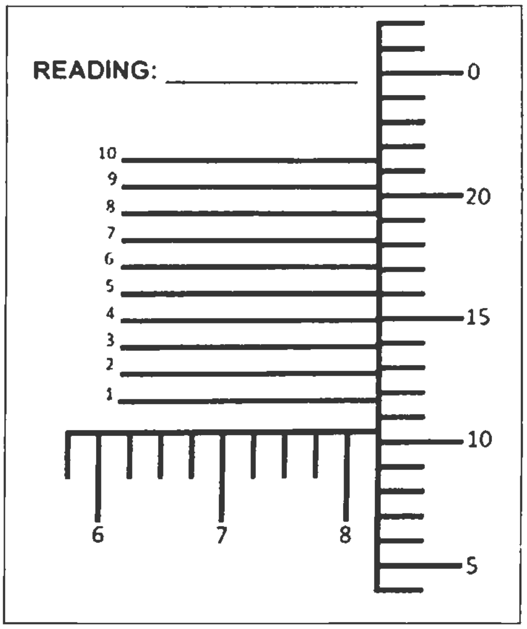
FIGURE C – READING .2507"

The "2" line on sleeve is visible, representing	**.200"**
There are two additional lines visible, each representing .025"	**.050"**
The reading line on the sleeve lies between the "0" and "1" on the thimble indicating that a vernier reading must be added	
The "7" line is the only line on the vernier that coincides with a line on the thimble, representing 7 x .0001"	**= .0007"**
The micrometer reading is	**.2507"**

Micrometer reading work

READING: ____________




READING: ____________

Appendix 2 – Logbook Entries and FAA Form 337

APPENDIX 2 – LOGBOOK ENTRIES AND FAA FORM 337		
Maintenance Records Requirements		
Radio and Antenna Installation		
Grimes Beacon Installation		
Wheel Pants Removal		
Gasculator Installation		
Carburetor Air Filter		

Maintenance Record Requirements

Writing logbook entries and completing maintenance forms are common projects for the practical exam. Applicants can expect to write one of four types of entries and complete a form 337 during the exam. Unfortunately, you will not be able to find a template or example of a logbook entry in the FARs, but you will be able to find the minimum requirements for a logbook entry in the FAR §43.9, §43.11, and §91.417. Other valuable references that can improve your understanding of maintenance record requirements include the AC 39-7D (Airworthiness Directives), AC 43-9C (Maintenance Records), and the FAA-G-8082-19 (Inspection Authorization Information Guide).

There are four logbook entry types you may be tested on. The first is a maintenance record entry, next is the 100-hour inspection entry, also there is a combination of the maintenance record and 100-hour, finally you could be asked to write an entry for an airworthiness directive. Although each type of entry has different specific requirements, they will all require a signoff based on your kind of certificate. The signoff requires your signature, certificate number and kind of certificate. If you are testing for the airframe and powerplant certificate, your kind of certificate is simply AP, if you're testing for just the airframe rating, or just the powerplant rating, your kind of certificate will be an A or P respectively.

Types of Entries

Standard Maintenance Entry

FAR §43.9 (a)(1) through (4)

Date: 01/13/2022 Total Time: 1800 hrs.

Removed Aviall NiCad battery, P/N 1234, S/N 4321 from station +20 and installed Concorde lead-acid battery, P/N 5678C, S/N 8765C in the same location in accordance with STC SA19TC. Reference 337 Dated 01/13/2022. Weight and balance computed and entered in the aircraft records. Equipment list revised. Operational check complete and satisfactory.

Signature
Cert# and cert type.

The basic maintenance entry must contain:

1 The date.
2 Description of the work performed.
3 Reference to acceptable data.
4 Signature.
5 Certificate #
6 Kind of Certificate.

Here is a great guide to help you remember what is required in the logbook entry.

1. What	***1. Wing***
2. Where	***2. Walkers***
3. How	***3. Heartrates***
4. Reference 337	***4. Rise***
5. Weight and Balance	***5. When***
6. Equipment List	***6. Engines***
7. Operational Check	***7. Over-temp***

In addition to the above requirements, the standard maintenance entry could require a "Reference 337" statement, a "weight and balance" statement and "equipment list" statement. The additional requirements are not found in FAR 43.9, because they are not always necessary to be included in the logbook entry. The additional statements can be found in the FAA-G-8082-19, which are only required when specific criteria are met.

1. **Reference 337 Statement:**

a. This statement is only required if the work performed was a major repair or alteration. Determining whether the work is a major or minor is the decision of the person performing the work. Generally, if a STC is used as a reference then the work is a major alteration.

2. **Weight and Balance statement:**

a. If the weight of the aircraft is affected by the removal or installation of an item, more than likely the empty weight CG will change. Anytime you perform weight and balance calculations, you should make an entry that states the weight and balance records were updated.

3. **Equipment list statement:**

a. The equipment list is provided by the manufacturer and identifies the items of equipment that are required to operate the aircraft. If the items of a different type or part number are installed, an entry should be made that the equipment list was revised.

100-hour Inspection Entry:

FAR 43.11(a)(1) through (4)

Airworthy example

Date: 01/13/2022 Total Time: 1800 hrs.

I certify that this aircraft has been inspected in accordance with a 100-hour inspection and was determined to be in airworthy condition.

Signature

Cert.# and cert type.

The airworthy 100-hour inspection entry must contain:

1. The Date
2. "I certify statement"
3. Aircraft total time
4. Signature
5. Certificate number
6. Kind of certificate

Unairworthy Example

Date: 01/14/2022 Acft Time: 1264 hrs.

I certify that this aircraft has been inspected in accordance with a 100-hour inspection and a list of discrepancies and unairworthy items dated 01/14/2022 has been provided to the aircraft owner or operator.

Signature

Cert# and cert type.

The unairworthy 100-hour inspection entry must contain:

1. The date
2. "I certify statement"
3. Aircraft total time
4. Signed and dated list of discrepancies. (There is no standard format for this list)
5. Signature
6. Certificate number
7. Kind of certificate

Examples of the statements for the 100-hour inspection entries can be found in FAR §43.11. The entry requirements are essentially the same, with the only difference being that an unairworthy statement should also include a reference to a signed and dated list of unairworthy items that have been supplied to the owner operator.

Date: 02/06/2022 Hobbs time: 1973 hrs.

Removed Aviall NiCad battery, P/N 1234, S/N 4321 from station +20 and installed Concorde lead-acid battery, P/N 5678C, S/N 8765C in the same location in accordance with STC SA19TC. Reference 337 Dated 02/06/2022. Weight and balance computed and entered in the aircraft records. Equipment list revised. Operational check complete and satisfactory. I certify that this aircraft has been inspected in accordance with a 100-hour inspection and was determined to be in airworthy condition.

Signature

Cert# and cert type.

Combination Logbook entry (Maintenance and 100-hour Inspection)

The combination logbook entry combines the standard maintenance entry and the 100-hour inspection entry into one statement. When writing a combination entry, follow the same requirements for the standard maintenance entry, and the inspection entry. Be sure to place the 100-hour "I Certify) statement at the end of the logbook entry.

Airworthiness Directive Entry

FAR §91.417(a)(2)(v)

Recurring AD Example

Date: 01/10/2022 Acft Total Time: ***533*** hrs.

Complied with Airworthiness Directive 80-11-04 dated 06/02/1980 in accordance with paragraph A, using a suitable light and mirror. No action needed at this time. Next compliance required at ***633*** hours in service.

Signature

Cert# and cert type

Recurring AD's must contain:

1. The date and total time
2. The AD number, and revision date
3. Method of compliance
4. If recurring, when the next action is required
5. Signature
6. Certificate #
7. Type of certificate

Completed AD Example

Date: 01/14/2022 Total time: 1968

Complied with AD 80-11-04 dated 06/02/1980 in accordance with paragraph B and the Cessna 150 maintenance manual by removing all 8 nutplates and replacing with AN365-428 nuts. No further compliance required. Reference 337 dated 01/14/2022. Operational check performed and found satisfactory. Signature

Cert# and cert type

Completed AD's must contain:

1. The date and total time
2. The AD number and revision date
3. Method of compliance
4. Reference to acceptable data is specific procedures are not outlined in the AD
5. Signature
6. Certificate #
7. Type of certificate

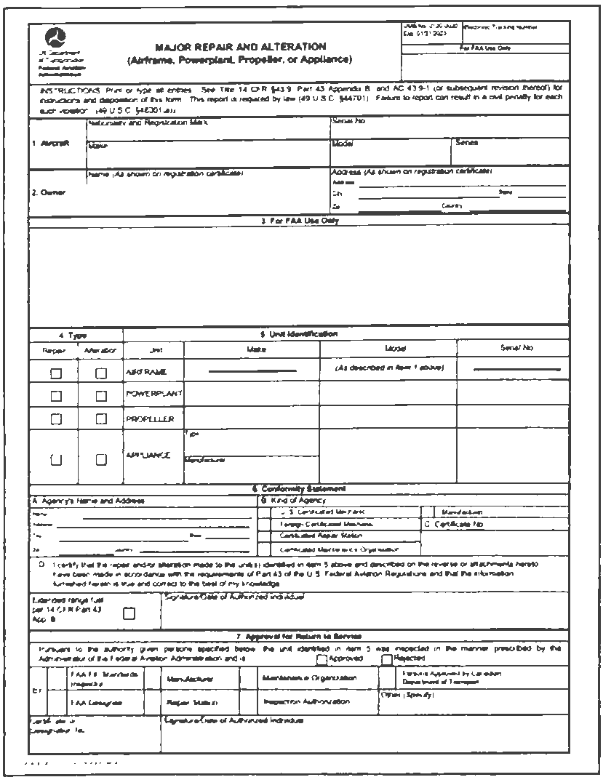
Maintenance record entries for airworthiness directives have similar requirements to entries for regular maintenance. However, specific information about the AD and method of compliance is required for AD entries because of the nature of the AD as it pertains to safety. Therefore, AD entries must include the AD number, and the revision date of the AD. The revision date is also referred to as the effective date of the AD, and can be found at the end or beginning of the AD. Also, many AD's have several options for compliance, which makes it important for the person performing the work to identify the exact method of compliance they used, along with any reference to outside data if necessary. Finally, if an AD is recurring the person complying with the AD must indicate when the next compliance is due. Next compliance should be stated as a value in addition to the current total time, number of landings, calendar date, etc. For example, if the aircraft currently has 1800 hours time in service and the AD requires action every 100 hours, then the next compliance would be required at 1900 hours time in service.

FAA Form 337

FAR §43.9 (d)

The FAA Form 337 is required by FAR §43.9 (d) in addition to the requirements of §43.9 (a) whenever a major alteration or major repair is performed. It is important to remember that is it the responsibility of the person who performs the work to complete the 337. It is often believed that the A&P is not allowed to perform major repairs or alterations, however, FAR §65.81 authorizes the A&P to perform or supervise major repairs or alterations so lang as they are not on the propeller. The A&P may not approve a major for return to service, but they may perform the work, and if they do, they are also responsible for completing the 337.

During the exam, you may be required to complete the 337 as part of your forms and records project. If you are asked to complete the 337, it will most likely coincide with and maintenance entry that you are asked to complete. Also, the examiner will supply you with a blank Form 337 to be completed, and all the information that you will need to fill the form out. Instructions for completing the 337 can be found in the AC 43.9-1F. (Which is on page 633 of the FAR AMT) The form is two sided: the front side of the form is simple to fill out by reading the title of the blocks. As the person performing the work, you are responsible for completing blocks 1,2,4,5,6, and 8. Do not write anything in block 3 (For FAA use only) or block 7 (Approval for return to service), as those blocks are reserved for the FAA, and individuals authorized to return a component or product to service after a major repair or alteration. Blocks 1,2,4,5, and 6 are simple to fill out by reading the title of the block. Block 8 it titled ***description of work accomplished*** and can be filled out using the same criteria as when completing a standard maintenance entry. Another important consideration when completing the back side of the form 337 is to never include a 100-hour "I certify" statement. Under no circumstances is the form 337 ever used to document an inspection; the form is only used for major repairs and alterations, so DO NOT include a 100-hour statement on the back of the form.



MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

For FAA Use Only

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No.	
	Make	Model	Series
2. Owner	Name (As shown on registration certificate)	Address (As shown on registration certificate)	

3. For FAA Use Only

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME		(As described in Item 1 above)	
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address

B. Kind of Agency

☐ U.S. Certificated Mechanic

☐ Foreign Certificated Mechanic

☐ Certificated Repair Station

☐ Certificated Maintenance Organization

☐ Manufacturer

C. Certificate No.

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐

Signature/Date of Authorized Individual

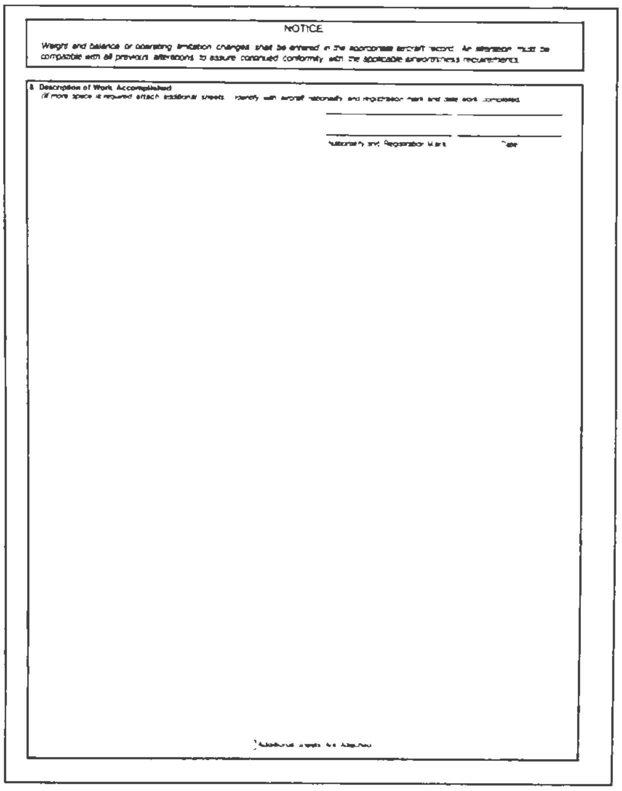
7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐	FAA Flt. Standards Inspector	☐	Manufacturer	☐	Maintenance Organization	☐	Persons Approved by Canadian Department of Transport
	☐	FAA Designee	☐	Repair Station	☐	Inspection Authorization		Other (Specify)

Certificate or Designation No.

Signature/Date of Authorized Individual



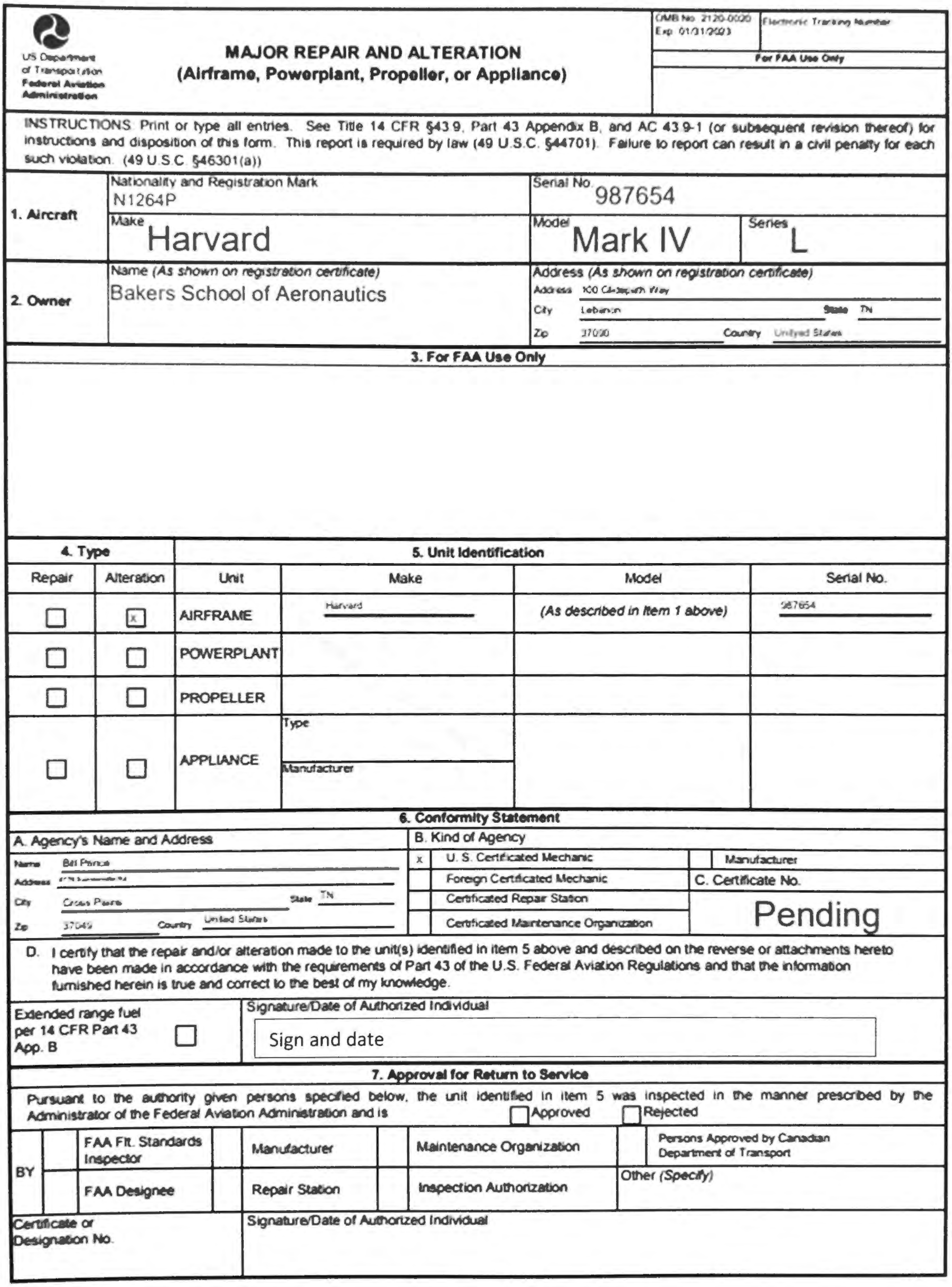
NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark　　Date



US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020
Exp. 01/31/2023

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark: N1264P	Serial No.: 987654
	Make: Harvard	Model: Mark IV Series: L
2. Owner	Name *(As shown on registration certificate)*: Bakers School of Aeronautics	Address *(As shown on registration certificate)* Address: [illegible] City: Lebanon State: TN Zip: 37090 Country: United States

3. For FAA Use Only

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Harvard	*(As described in Item 1 above)*	987654
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name: Bill Prince
Address: [illegible]
City: Cross Plains State: TN
Zip: 37049 Country: United States

B. Kind of Agency
x U.S. Certificated Mechanic
Foreign Certificated Mechanic
Certificated Repair Station
Certificated Maintenance Organization
Manufacturer

C. Certificate No.
Pending

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐

Signature/Date of Authorized Individual
Sign and date

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.

Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark ______ Date ______

Removed an Avail Ni-Cad battery, Part Number 1234, Serial Number 4321 from station +20 and installed a Concorde lead acid battery. Part Number 5678C, Serial Number 8765B in the same location in accordance with Supplemental Type Certificate SA19TC. Weight and balance computed and entered in the aircraft records. Equipment list revised, Operational checks performed and found satisfactory.----------------------------END--

Reminders!

1. *DO NOT reference the 337 on the back of the 337.*
2. *DO NOT put the make, model, serial number or total time of the aircraft on the back of the 337.*
3. *DO NOT put the 100-hour statement on the back of the 337.*
4. *DO NOT sign the back of the 337.*

☐ Additional Sheets Are Attached

Radio and Antenna Installation

You have performed the following tasks on YOUR aircraft. Complete the FAA form 337, required logbook entry, and weight and balance for this work.

A King radio (Model KX-170B, S/N 3446 was removed from station +14 and a Bendix radio (Model KX-125, S/N5667) was installed in the same location. Also, a King antenna (Model 355, S/N 7809) was removed from station +76.8 and a Comant Industries antenna (Model CI-121, S/N 2336) was installed at the same location. **ALL WORK** was performed in accordance with STC SA109AC **and** the Bendix Radio Model KX125 installation manual, P/N KX717A3. **A 100-hour inspection was also performed, and the aircraft was determined to be in airworthy condition.** ***(Note: The Bendix radio installation manual will also include the antenna installation procedures.)***

Aircraft: Cessna 172N

Registration Number: N2345

Serial Number: 123445

Aircraft total time: 9806 hours

Empty Weight: 1765lbs

Empty weight CG: +37

Radio weights	**Antenna weights**
King 7.5 lbs.	King 4.5 lbs.
Bendix 2.5 lbs.	Comant 1.5 lbs.

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

Date: **(LOGBOOK ENTRY)** **Aircraft Time:**

US Department
of Transportation
**Federal Aviation
Administration**

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp. 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No.	
	Make	Model	Series
2. Owner	Name *(As shown on registration certificate)*	**Address** *(As shown on registration certificate)* Address ______ City ______ State ______ Zip ______ Country ______	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME	______	*(As described in Item 1 above)*	______
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency	
Name ______	☐ U.S. Certificated Mechanic	☐ Manufacturer
Address ______	☐ Foreign Certificated Mechanic	C. Certificate No.
City ______ State ______	☐ Certificated Repair Station	
Zip ______ Country ______	☐ Certificated Maintenance Organization	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark	Date

☐ Additional Sheets Are Attached

Grimes beacon installation

You have performed the following alteration. Complete the FAA form 337, required logbook entry and the weight and balance for the work.

A Grimes rotating beacon P/N RD321, S/N RB224 was removed from the bottom of the fuselage at station +82, and a Grimes strobe beacon, P/N SB123, S/N 987SB was installed at the same location in accordance with STC SA1123SB.

Aircraft: Cessna 182RG

Registration Number: N253RG

Serial Number: 182113R

Aircraft time: 1820 hrs.

Aircraft owner: TN Tech Center
25543 Centennial Blvd.
John C. Tune Airport

Empty weight: 1800 lbs.

Empty weight CG: +40

Grimes rotating beacon: 5.4 lbs.

Grimes strobe beacon: 3.6 lbs.

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

Date: **(LOGBOOK ENTRY)** **AIRCRAFT**
TIME:

US Department
of Transportation
**Federal Aviation
Administration**

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp. 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No.	
	Make	Model	Series
2. Owner	Name *(As shown on registration certificate)*	Address *(As shown on registration certificate)* Address ____ City ____ State ____ Zip ____ Country ____	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME	____	*(As described in Item 1 above)*	____
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency	
Name ____	☐ U. S. Certificated Mechanic	☐ Manufacturer
Address ____	☐ Foreign Certificated Mechanic	C. Certificate No.
City ____ State ____	☐ Certificated Repair Station	
Zip ____ Country ____	☐ Certificated Maintenance Organization	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark	Date

☐ Additional Sheets Are Attached

Wheel pants removal

You have performed the following alteration. Complete the FAA form 337, required logbook entry and weight and balance for this work.

You have **removed** the wheel pants from a Piper PA-22-150, S/N 22150005, N150PA, in accordance with STC SA3345. The aircraft total time is 3855 hrs. The aircraft empty weight is 1670 lbs. with a C.G. of +14.25. The weight of the removed wheel pants are as follows: Nose wheel pants, P/N WP115N (8.5 lbs. at a -24); left and right main wheel pants, P/N WP115M (12.3 lbs. **each** at +17.8).

The aircraft owner is listed as:

Miller, Laurel

123 Main Street

Hendersonville, TN 37222

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

Date: **(LOGBOOK ENTRY)** **Total time:**

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp. 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No.	
	Make	Model	Series
2. Owner	Name *(As shown on registration certificate)*	Address *(As shown on registration certificate)* Address ____ City ____ State ____ Zip ____ Country ____	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME	________	*(As described in Item 1 above)*	________
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency	
Name ____	☐ U.S. Certificated Mechanic	☐ Manufacturer
Address ____	☐ Foreign Certificated Mechanic	C. Certificate No.
City ____ State ____	☐ Certificated Repair Station	
Zip ____ Country ____	☐ Certificated Maintenance Organization	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark ____________________

Date ____________________

☐ Additional Sheets Are Attached

Wheel and brake installation

You have performed the following alteration. Complete the FAA form 337, required logbook entry and weight and balance for this work.

You have removed the existing Cleveland brakes, P/N 22333, S/N 4455, from both main gears at station +110 and installed Parker Hamilton Wheel and Brake kit#3321 to the same location, in accordance with STC SA648GL, Parker Hamilton Brake Assembly Installation Manual P/N PH9542B, and the Mitsubishi MU-2B-26A Maintenance Manual. You have also performed a 100-hour inspection and determined the aircraft to be airworthy.

Aircraft: Mitsubishi MU-2B-26A

Registration Number: N8910

Serial Number: 1234567

Aircraft total time: 2151 hrs.

Aircraft Owner: Mid-South Aviation
123 Hangar Rd.
Murfreesboro TN 37200

Empty weight: 2500 lbs.

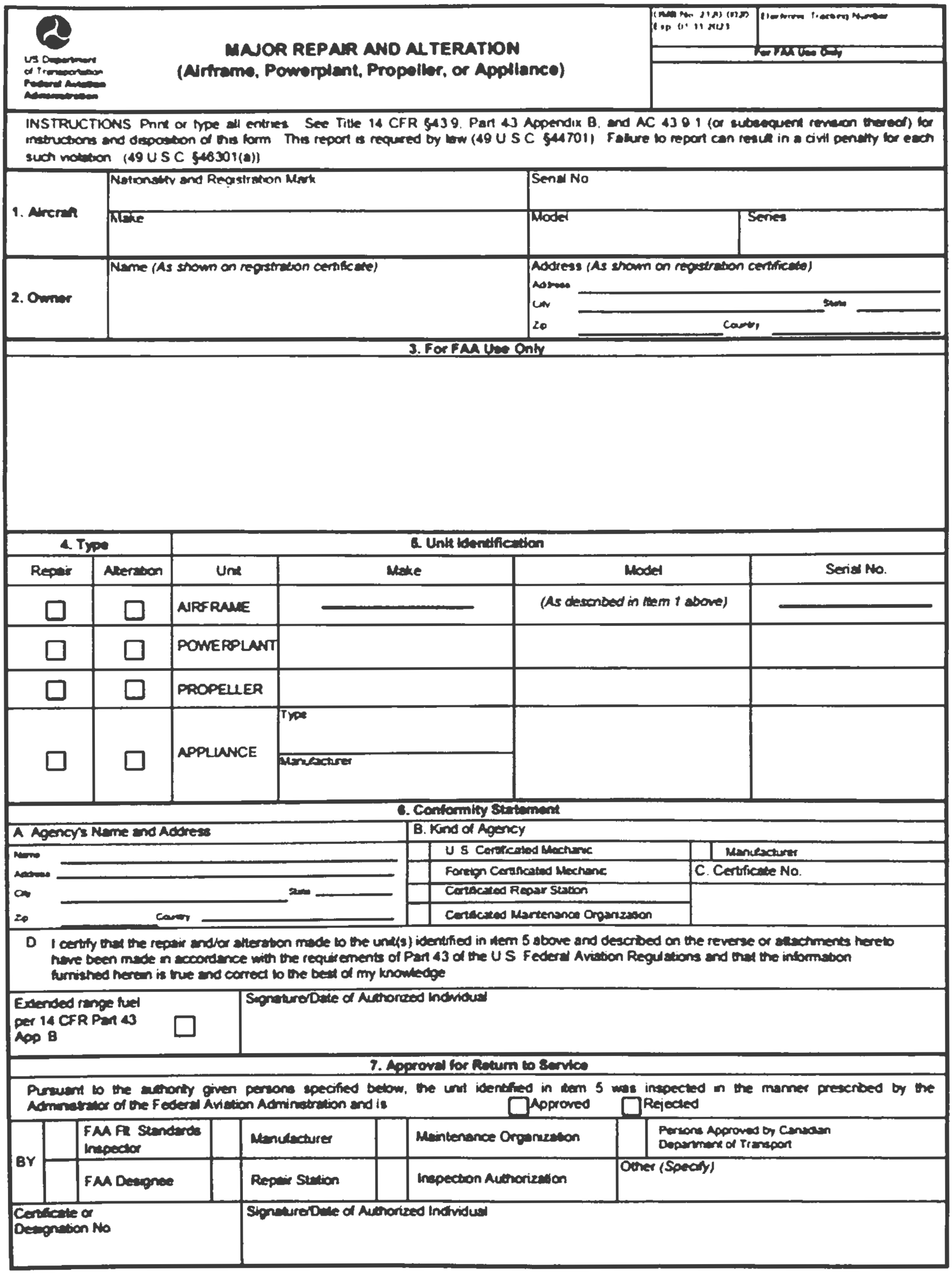
Empty weight CG: +95

Cleveland Brakes: 35 lbs. each

Parker Brakes: 45 lbs. each

Item	Weight	Arm	Moment
Total			

Date: Total time:



US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020
Exp. 01 31 2023

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No	
	Make	Model	Series
2. Owner	Name *(As shown on registration certificate)*	Address *(As shown on registration certificate)* Address City State Zip Country	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME		*(As described in item 1 above)*	
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name
Address
City State
Zip Country

B. Kind of Agency
☐ U.S. Certificated Mechanic
☐ Foreign Certificated Mechanic
☐ Certificated Repair Station
☐ Certificated Maintenance Organization
☐ Manufacturer

C. Certificate No.

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

A58

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark ____________________ Date ____________________

☐ Additional Sheets Are Attached

Gasculator installation

You have performed the following alteration. Complete the FAA form 337, required logbook entry and the weight and balance for this work.

You have removed the existing fuel Gasculator (strainer/separator), P/N 9988, S/N 7766, from the front face of the firewall (station -18) and installed a new "Steve's" Gasculator, P/N 02235S, SN 11236S, in the same location, in accordance with STC SA01026SE. There will be no change in the weight and balance data.

Aircraft: Piper PA-22-150

Registration number: N150PA

Serial Number: 22150005

Aircraft total time: 2448 hrs.

Aircraft owner: Miller, Rodney
Miller, Laurel
123 Mian street
Hendersonville, TN 37222

Date: **Total time:**

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020
Exp. 01/31/2023

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No.	
	Make	Model	Series
2. Owner	Name *(As shown on registration certificate)*	Address *(As shown on registration certificate)* Address City State Zip Country	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME	————————	*(As described in Item 1 above)*	————————
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name
Address
City State
Zip Country

B. Kind of Agency
☐ U.S. Certificated Mechanic
☐ Foreign Certificated Mechanic
☐ Certificated Repair Station
☐ Certificated Maintenance Organization
☐ Manufacturer

C. Certificate No.

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐

Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization

☐ Persons Approved by Canadian Department of Transport

Other *(Specify)*

Certificate or Designation No.

Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark	Date

☐ Additional Sheets Are Attached

Carburetor air filter

You have performed the following alteration. Complete the FAA form 337 and required logbook entry.

You have removed the existing carburetor air filter, P/N 9987, S/N 1123, from the carburetor heat box at station -14 and installed a Brackett Air Filter Assembly # BA4208 in the same location, in accordance with STC SA71GL, Brackett Filter Assembly Installation Manual PN BFGAB3, drawing# BF1448C, revision 15, dated August 13, 1986. There are no changes to the weight and balance.

Aircraft: Cessna 150A

Registration Number: N891CA

Serial Number: 150A567

Aircraft total time: 4339 hrs.

Aircraft owner: Tullahoma Aviation
2668 Taxi Way Lane
Tullahoma, TN 37355

Date: **Time:**	**Total**

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No 2120 0020
Exp 01/31/2023

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS Print or type all entries See Title 14 CFR §43.9. Part 43 Appendix B. and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation (49 U S C §46301(a))

1. Aircraft	Nationality and Registration Mark	Serial No.	
	Make	Model	Series
2. Owner	Name *(As shown on registration certificate)*	Address *(As shown on registration certificate)* Address City State Zip Country	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☐	AIRFRAME	————	*(As described in Item 1 above)*	————
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name
Address
City State
Zip Country

B. Kind of Agency
☐ U. S. Certificated Mechanic
☐ Foreign Certificated Mechanic
☐ Certificated Repair Station
☐ Certificated Maintenance Organization
☐ Manufacturer

C. Certificate No.

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark ____________ Date ____________

☐ **Additional Sheets Are Attached**

Appendix 3 - Solutions

FAR Research - Solution		
Temperature Conversion - Solution		
AC 43.13-1B Research - Solution		
Weight and Balance - Solution		
Basic Electricity - Solution		
Resistor Check - Solution		
Cable Tension - Solution		
Torque Wrench - Solution		
River Diameter and Length - Solution		
Rivet Layout - Solution		
Sheet Metal Bending - Solution		
Illustrated Parts Manual Research - Solution		
Type Certificate Data Sheet / Aircraft Specification -		
Airworthiness Directive Research - Solution		
Micrometer Reading - Solution		
Radio and Antenna Installation - Solution		
Grimes Beacon - Solution		
Wheel Pants Removal – Solution		
Wheel and Brake Installation - Solution		
Gasculator Installation - Solution		
Carburetor Air Filter - Solution		

FAR Research – Solutions

FAR Part 43 (The Mechanics FAR)

FAR 43.11 (a)(4) – Covers logbook entries for inspections.

Please copy the statement that would be entered in the logbook after performing a 100-hour inspection, if the aircraft is determined to be airworthy.

I certify that this aircraft has been inspected in accordance with a 100-hour inspection and was found to be in airworthy condition.

FAR 43, Appendix D – Scope and detail for a 100-hour or annual inspection. (checklist)

List the paragraph (a,b,c,d etc.) that provides the checklist for a 100-hour inspection for the following:

Airframe empennage: ***paragraph (g)***

Engine: ***paragraph (d)***

Landing gear group: ***paragraph (e)***

FAR Part 45 – Mark

What are the height requirements for the nationality and registration markings for the following aircraft? List the paragraph(s) where the requirement is found.

1941 P-51 Mustang War Bird restored to its original condition and flown only during the making of movies:

FAR 45.22, paragraph: *(a)* Height requirement: ***Markings not Required***

1941 J3 Piper Cub flown for personal pleasure only.

FAR 45.22, paragraph: ***(b) (1)*** Height requirement: ***at least 2 inch***

1949 Cessna 172RG repainted in 1994.

FAR 45.29, paragraph: ***(b)(1)(i)*** Height requirement: ***at least 12 inches***

Any non-spherical balloon.

FAR 45.29, paragraph: ***(b)(2)*** Height requirement: ***at least 3 inches***

What would be the location of the marks on a spherical balloon?

FAR 45.29, paragraph: ***(c)*** Height requirement: ***in two places diametrically opposite and near the maximum horizontal circumference of the balloon.***

FAR part 65 (privileges and limitations)

FAR 65.21 – Change of Address.

Who must be notified after any change in your permanent address? ***The FAA***

Where must the notification be sent? ***DOT, FAA***

Airmen Certification Branch
P.O. Box 25820
Oklahoma City, OK 73125

Within how many days after the change in the mailing address must eh notification be made? ***30 days***

FAR 65.83 – Recent experience requirements.

What are the recent experience requirements for a mechanic?

A certified mechanic may not exercise the privileges of his certificate and rating unless within the preceding ***24*** months he has, for at least ***6*** months, served as a ***mechanic*** under his certificate and rating, or technically ***supervised*** other mechanics, or supervised, in an executive capacity, the ***maintenance*** or ***alteration*** of aircraft or has been engaged in any combination of par. (b)(1)(2)(3), or the ***administrator*** has found that he is able to do that work.

FAR 65.89 – Display of Certificate.

Where is the mechanic required to keep his license (certificate)?

In the ***immediate*** area where he normally exercises the privileges of his license.

Who are the five persons that have the right to inspect your license?

The ***administrator*** or an authorized ***representative*** of the National Transportation Safety Board, or any ***federal, state or local*** law enforcement officer.

FAR Part 91 – (The Owner's/Operator's FAR)

FAR 91.207 (c)(d) – Emergency Locator Transmitter (ELT).

When must the batteries used in the ELT be replace (or recharged, if the batteries are rechargeable)?

When the transmitter had been in use for more than ***one cumulative*** hour, or when ***50*** percent of their ***useful*** life is lost. For ***rechargeable*** batteries ***50*** percent of ***useful*** life charge.

How often must the ELT be inspected and what does the inspection check for?

The ELT must be inspected within ***12 calendar*** months after the last inspection. The inspection is checking for ***proper*** installation, and (2) battery ***corrosion.*** Operation of the (3) ***controls*** and ***crash sensor*** (4) the presence of a sufficient ***signal*** radiated from its ***antenna.***

What frequency is used to test the ELT and how can it be tested?

Note: Answer is not found in this FAR. It can be found in the FAR/AIM (Airman's information Manual).

The ELT may be tested by turning the VHF communication receiver to **121.5** Mhz. The test should be conducted only during the **first five** minutes of any hour and should be restricted to **three** audio sweeps.

FAR 91.213 (d)(3)(i)(ii) – Inoperative Instruments and Equipment.

An aircraft may be operated with inoperative instruments and equipment without an approved MEL (minimum Equipment List) **provided** the inoperative instruments and equipment are EITHER...

(iii) Removed from the aircraft, the cockpit control placarded and the maintenance record in accordance with FAR 43.9 or...

(iv) The instruments and equipment are ***deactivated*** and ***placarded*** ***"INOPERATIVE"*** If the deactivation involves maintenance, it must be accomplished and recorded **in accordance with FAR 43.9**. (a logbook entry must be made).

FAR 91.411 (a)(1) – Altimeter Testing.

In order to operate an airplane or helicopter in controlled airspace under ***IFR,*** the altimeter instrument must be tested and inspected within the preceding ***24 Calendar*** months and found to comply with FAR ***43***, app. ***E***

FAR 91.413 (a) – ATC Transponder Test and Inspection.

No person may use an ATC transponder unless, within the preceding ***24 calendar*** months, the ATC transponder has been tested and inspected and found to comply with FAR ***43***, Appendix ***F***.

Temperature Conversion - Solutions

Using the above formulas, convert the following. Please show your work.

22°C to F: *22 x 1.8+32=71.6*

49°C to F: *49x1.8+32=120.2*

40°F to C: *40-32÷1.8=4.4*

92°F to C: *92-32÷1.8=33.3*

-12°F to C: *-12-32÷1.8=24.4*

AC 43.13-1B Research - Solutions

Chapter 2, paragraph ***2-33b***, page***2-35***.

What is the required **strength criteria for fabric** if performing a fabric punch test on an aircraft with a wing loading of 9 psf or greater or a placard *never exceed speed of 160mph or greater*? ***56 lbs. per inch width***

(Note: As soon as fabric comes off the roll, it is considered to be deteriorated).

Chapter 2, Table***2-1*** page ***2-3.***

What type of fabric would be used on an aircraft with a wing loading of 7 psf and a never exceed speed of 130 mph? ***Airplane cloth mercerized cotton.***

Chapter 2, Figure ***2-12*** page ***2-21***

What would be the rib 1 spacing for an aircraft with a VNE of 200mph in the slip stream? ***1.9 inches***

What would be the rib stitch spacing for an aircraft with a VNE of 200mph other than in the slip stream?

2.5 inches

Chapter 2, paragraph 2-9, c.

What does *in the slip stream* (propwash) mean? ***The diameter of the propeller plus one outboard rib on either side.***

Find the repair for an elongated **wooden spar** bolt hole. Chapter ***1***, paragraph ***1-45***

Find the instructions for installing fittings on a high-pressure hose. Chapter ***9***, Figure ***9-8***

According to the Figure, what is the **extra step** that must be completed for installing fittings on a **high-pressure** hose?

Step 2. Locate the length of hose to be cut off and slit the cover with a knife to the wire braid. After slitting cover, twist off with a pair of pliers.

How does the hydrostatic test have to be performed on a standard weight cylinder? (Portable fire extinguisher)

(Note: AC 43.13-1B does not provide any data specifically on fire extinguishers. The testing frequency is the same as for the oxygen standard weight cylinder.)

Chapter ***9***, paragraph ***9-51***

Standard weight cylinders must be hydrostatically tested at the end of each ***5-year*** period.

AC43.13 Research - solutions continued

Find the table of filling pressures for oxygen cylinders. To what pressure would you fill an oxygen cylinder if the temperature is 23°C? Chapter ***9*** Table ***9-5***

Step 1.

Convert 23°C to F using the formula:
C*1.8+32=F

=23*1.8+32

=41.4+32

=73.4°F

Step 2.

According to the Table, the filling pressure for...

70°F – 1975psi

80°F – 2000psi

Step 3.

To determine the filling pressure for 73.4, calculate as follows:

80°------------------2000psi

-70°------------------1975psi

10°---------------------25psi

25psi ÷10° = 2.5psi

(2.5 is the increase in psi for each degree above 70°)

Remember...our temperature is 3.4° above 70°

3.4° * 2.5psi = **8.5 (total increase in psi)**

70° --------------1975 psi

+3.4°-------------8.5 psi

73.4°-------------1983.5 psi

Following the previous example, to what pressure would you fill an oxygen cylinder if the temperature is 15°C?

Step 1.

Convert 15°C to F using the following formula:

C * 1.8 + 32 = F

= (15X1.8) +32

= 27+32

= 59°

Step 2.

According to the table, the filling pressure for...

50°F – ***1875 psi***

60°F – ***1925 psi***

Our temperature is ***59°*** (***9°*** above 50°)

Step 3.

To determine the filling pressure for ***59°***

Calcúlate as follows

60°------------------1925psi

-50°------------------ psi

10°--------------------25psi

___psi ÷ 10° = ______psi

(5 is the increase in psi for each degree above 50°)

9°degrees X ***5 psi = 45 psi***

(Note: Some numbers are filled in for you to help keep track. Please complete the remainder of the problem.)

Step 4.

50° --------------***1875 psi***

+ 9 °------------- 1925 psi

59°------------- ***1920 psi***

To what pressure would you fill an oxygen cylinder if it is -5°C?

Step 1.

Convert -5°C to F using the following formula:

(C x 1.8) + 32
= (-5 x 1.8) + 32
= -9 +32
= 23°F

Step 2.

According to the Table, the filling pressure for...
20 degrees F --- 1725 psi
30 degrees F --- 1775 psi

Our temperature is 23° (3° above 20°)

Step 3.

To determine the filling pressure for 23°, calculate as follows:

30° = 1775 psi
- 20° = 1725 psi
10° = 50 psi

50° ÷ 10 psi = 5 psi
(5 is the increase in psi for each degree above 20°)
(Remember... our temperature is 3° above 20°)

3 degrees x 5 psi = 15 psi

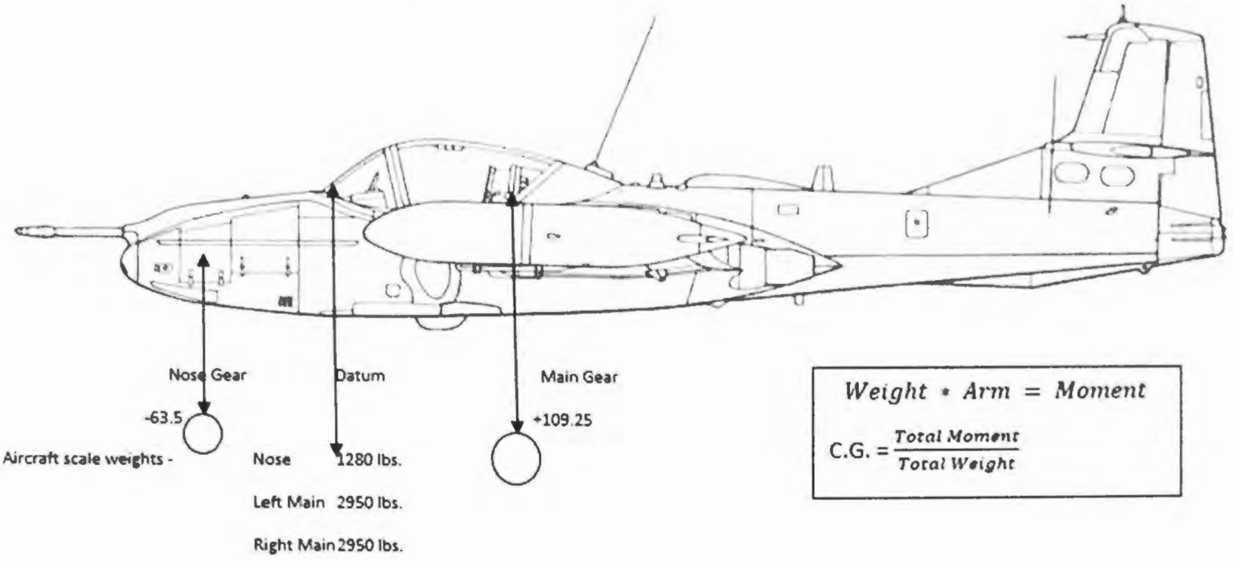
Step 4.
20° = 1725 psi
+ 3° = 15 psi
23° = 1740 psi

List Five main types of corrosion. Chapter *6*, Section *2*.

FDISS

1. *Fretting corrosion*
2. *Dissimilar / Galvanic corrosion*
3. *Intergranular corrosion*
4. *Surface Corrosion*
5. *Stress Corrosion*

Weight and Balance – Solutions



$$\text{Weight} * \text{Arm} = \text{Moment}$$

$$\text{C.G.} = \frac{\text{Total Moment}}{\text{Total Weight}}$$

When the aircraft was weighed, the jack pads were left attached to the jack points. The two jack pads weighed 12.4 lbs. **each** and were located at station +86.4. The unusable fuel, weighing 96.3 lbs. had been completely drained from the fuel system at station +102. **What is the empty weight and empty weight C.G. for this aircraft?**

Item	Weight	Arm	Moment
Nose Gear	*1280*	*-63.5*	*-81280*
Left Main	*2950*	*109.25*	*322287.5*
Right Main	*2965*	*109.25*	*323926.25*
Jack Pads (2)	*-24.8*	*86.4*	*-2142.72*
Fuel	*96.3*	*102*	*9822.6*
Total	*7266.5*	*78.80*	*572613.63*

Weight and Balance -solutions continued

Practice 1

Aircraft empty weight: 1667 lbs.

Empty weight C.G.: +26.5

Gross/Max weight: 2265 lbs.

The aircraft was altered as follows:

1. The battery weighing 33.5 lbs. at Station -14 was relocated to station +32.3
2. A rotating beacon weighing 4.8 lbs. was installed on the bottom of the fuselage at station +19.
3. A fire ext. weighing 3.5 lbs. was installed at station -2.

What is the new empty weight? ***1675.5 lbs.***

What is the new empty weight C.G.? +*30.32*

What is the useful load? ***589.7 lbs.***

Item	Weight	Arm	Moment
Aircraft empty weight	*+1667*	*+29.5*	*+49176.5*
Battery removal	*-33.5*	*-14*	*+469*
Battery install	*+33.5*	*+32.3*	*+1082.05*
Beacon	*+4.8*	*+19*	*+91.2*
Fire Ext.	*+3.5*	*-2*	*-7*
Total	*+1675.3*	*+30.32*	*+50811.75*

Practice 2

A Piper PA-22-150 weighed 1125 lbs. at a C.G. of +23.25 before removing the three-wheel skirts per an STC. The nose wheel skirt located at -14 weighed 11.25 lbs. The **two** main wheel skirts located at +31.8 weighed 16.33 lbs. **each**. The max/gross weight of the aircraft is 1645 lbs.

What I the new C.G.? *+23.38*

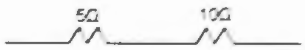
What is the useful load? *563.91*

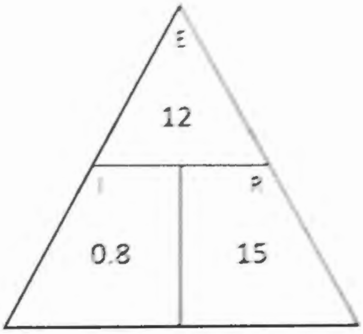
Item	Weight	Arm	Moment
Aircraft empty weight	*+1125*	*+23.25*	*+26125.25*
Nose Skirt	*-11.25*	*-14*	*+157.5*
Main Skirts	*-32.66*	*+31.8*	*-1038.58*
Total	*+1081.09*	*+23.38*	*+25275.17*

Basic Electricity - Solutions

(Solve the below problems using the given information and Ohm's law, show your math)

Series Circuit

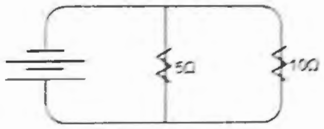


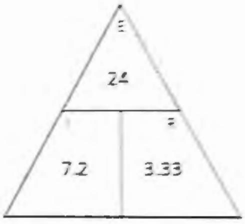


Known information: **0.8 Amps**

Find the voltage: ***12 volts***

Parallel Circuit

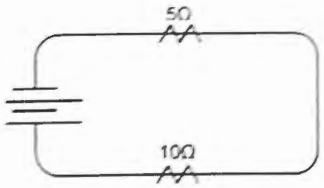


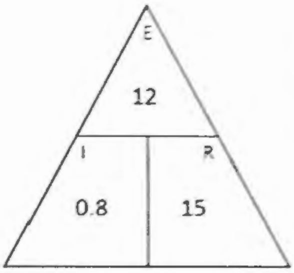


Known information: **7.2 Amps**

Find the voltage: ***24 volts***

Voltage Drop





ED = I x R

ED = ***0.8***x 5Ω

ED = ***0.8 x 10 = 8***

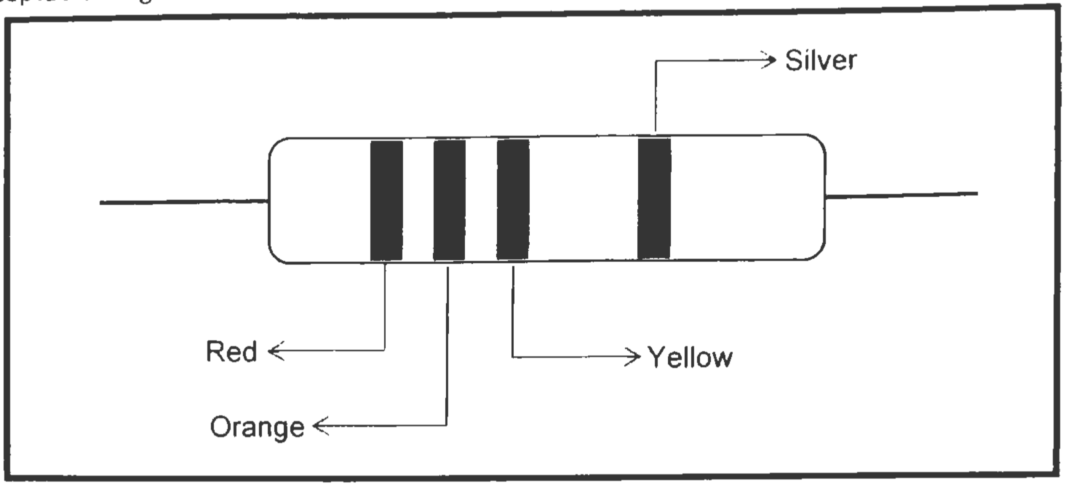
Known information: **12 Volts**

Find the Voltage drop after 5Ω: ***4***

Find the Voltage drop after 10Ω: ***8***

Resistor check - Solutions

Using the below resistor, and the given color bands, perform the required steps in order to determine the acceptable range of resistance.



1st band ***RED which corresponds with 2***

2nd band ***ORANGE which corresponds with 3***

3rd band ***YELLOW which corresponds with 4 zeros***

4th band ***SILVER which corresponds with ±10%***

SHOW ALL MATH

230,000 ±10% is the number produced by reading the color-bands.

You first must calculate what 10% of 230,000 is, you can do this via two methods. Enter 230,000 in your calculator and multiply by 10% or multiply by .1

230,000 x 10% = 23,000

Then you must calculate the plus or minus range.

230,000 – 23,000 = 207,000Ω

230,000 + 23,000 = 253,000Ω

So this resistor is good as long as it ohms out between 207,000Ω and 253,000Ω

Cable Tension – Solutions

1. If the examiner wants you to measure a 1/8" cable, which riser will you need? ***#1***
2. If are measuring a 7/32" cable, which riser is required? ***#3***
3. When measuring a 3/32" cable the tensiometer reads 46, what is the cable tension? ***60 lbs.***
4. The tensiometer reads 14 on a 1/16" cable, what is the cable tension? ***20 lbs.***
5. If the examiner wants a cable to have a tension of 100lbs, on a 3/16" cable, what should the tensiometer read? ***64***

Torque Wrench – Solutions

Answer: 692-inch lbs.

A landing gear trunnion nut requires a torque of ***416 in-lbs.*** To reach the nut, a 4" straight adapter must be used on a 12' torque wrench. How many ***ft-lbs.*** will be indicated on the torque wrench when the required torque of the nut is reached? Show all your work.

$$\frac{416\,x\,12}{12+4} = \frac{4992}{16} = 312\ inch\ lbs.\ \ \frac{312}{12} = 26\ foot\ lbs.$$

Foot lbs. indicated on the torque wrench: 26 lb/ft

Find the diameter and length of the rivet for the following problems. PLEASE SHOW YOUR WORK.

Two sheets, one of **0.032"** and one of **0.024"**

D = 3 x the thickest sheet	***L = grip + (1.5 x D)***
= 3 x 0.032	*= 0.056 + (1.5 x 0.125)*
= 0.096	*= 0.056 + 0.1875*
= 0.096 x 32	*= 0.2435 x 16*
$= \frac{3.072}{32} = \frac{4}{32}$	$= \frac{3.896}{16} = \frac{4}{16}$

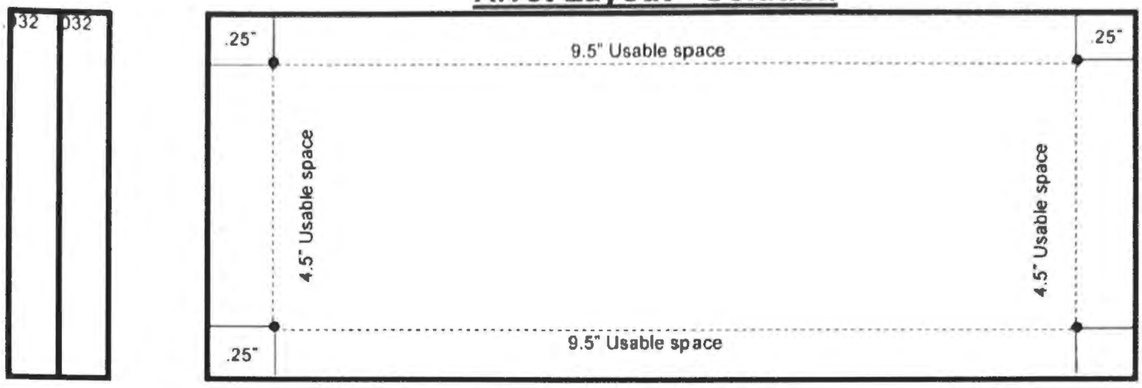
Two sheets, one of **0.064"** and one of **0.020"**

D = 3 x the thickest sheet	***L = grip + (1.5 x D)***
= 3 x 0.064	*= 0.084 + (1.5 x 0.21875)*
= 0.192	*= 0.084 + 0.328125*
= 0.192 x 32	*= 0.412125 x 16*
$= \frac{6.144}{32} = \frac{7}{32}$	$= \frac{6.594}{16} = \frac{7}{16}$

Two sheets, one of **0.045"** and one of **0.032"**

D = 3 x the thickest sheet	***L = grip + (1.5 x D)***
= 3 x 0.045	*= 0.077 + (1.5 x 0.15625)*
= 0.135	*= 0.077 + 0.234375*
= 0.135 x 32	*= 0.311375 x 16*
$= \frac{4.32}{32} = \frac{5}{32}$	$= \frac{4.982}{16} = \frac{5}{16}$

Rivet Layout - Solution



Determine how many rivets would be required to attach a 10" x 5" plate, 0.032" thick, to a piece of metal with the same thickness.

Use: For your edge rivets, use Minimum Edge Distance. (2D)
For your spacing use 4D.
Also calculate the length of the rivet to be used.
SHOW YOUR WORK

1. Find the diameter.
D = 3 x thickest sheet
= 3 x 0.032
= 0.096 x 32
= 3.072 (round up to 4)
= 4/32

2. Find edge distance.
Edge distance = 2 x D
= 2 x 0.125
= 0.25

3. Plot edge rivets. (all four corners)

4. Calculate usable space for all four sides.
10 inches – 0.25 – 0.25 = **9.5 inches**
5 inches – 0.25 – 0.25 = **4.5 inches**

5. Calculate rivet spacing.
Spacing = 4 x D
=4 x 0.125
=0.5 spacing

6. Take the usable space and divide it by the spacing.
9.5 ÷ 0.5 = 19 spaces **(18 rivets)**
4.5 ÷ 0.5 = 9 spaces **(8 rivets)**

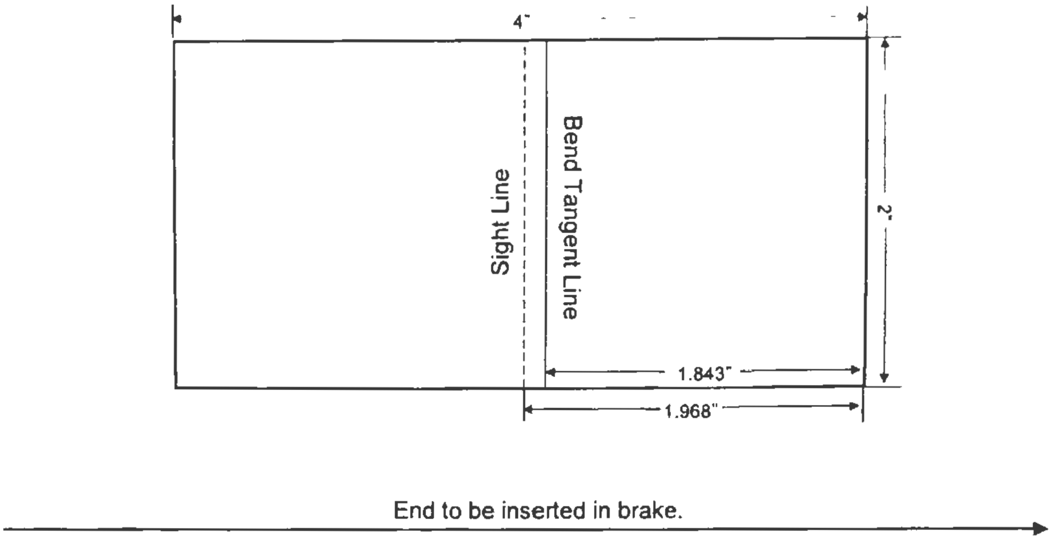
7. Find the total number of rivets.
18 +18 + 8 + 8 +4 (edge)
= 56 total rivets

8. Calculate the length of the rivet.
L = grip + (1.5 x D)
= 0.064 + (1.5 x 0.125)
= 0.064 + 0.1875
= 0.2515 x 16
= 4.02 (only round up for 0.5 or above)
= 4/16 length

Sheet Metal Bending - Solutions

Example 2:
For this project, the examiner has handed you a piece of metal that is 4" *l* x 2" *w* and 0.032" thick. He wants you to create a 90° bracket using a 1/8" radius bar. The leg should be 2"

Step 1. Sketch the metal to scale, and determine the end that can be inserted into the brake easiest.



Step 2: Determine radius, thickness, mold line dimension, and the end of the metal that will go into the brake.

R = 0.125"
T = 0.032"
MLD = 2"

Step 3: Determine setback.

$$\boldsymbol{SB = R + T}$$
$$SB = 0.125 + 0.032''$$
$$SB = 0.157''$$

Step 4: Find the flat line dimension (flat) of the end to be formed.

$$\boldsymbol{Flat = MLD - SB}$$
$$Flat = 2'' - 0.157''$$
$$Flat = 1.843''$$

Step 5: Using the flat line dimension, sketch the bend tangent line on the layout.

Step 6: Calculate the sight line.

$$\boldsymbol{SL = BTL + R}$$
$$SL = 1.843 + 0.125$$
$$SL = 1.968''$$

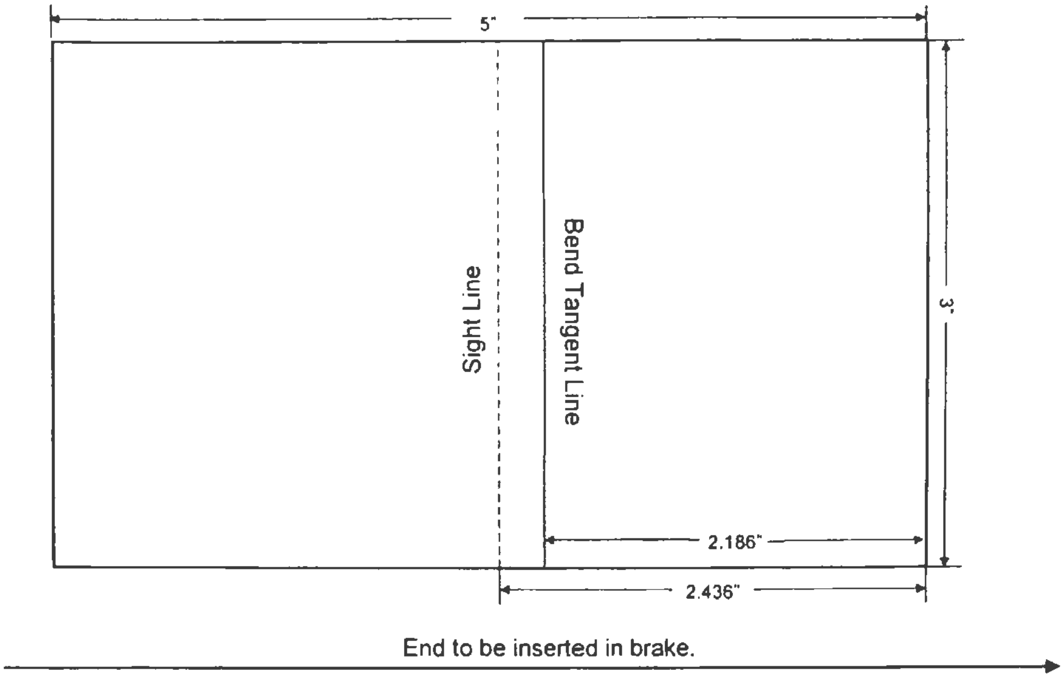
Step 7: Locate the sight line by measuring in from the bend tangent line.

After completing the steps above, you will have to transfer your sketch to the actual metal. When bending the metal, be sure to insert the correct end into the brake, and use the *sight line* to line the bend up with the end of the radius bar. Then clamp the metal in place and finally bend to the desired angle.

Example 3:

The examiner wants you to make a 90° bend in a 5" l x 3" w piece of metal that is 0.064" thick The bend radius will be ¼", and the bend needs to be in the middle of the 5" length.

Step 1 Sketch the metal to scale, and determine the end that can be inserted into the brake easiest.



Step 2: Determine radius, thickness, mold line dimension, and the end of the metal that will go into the brake.

R = 0.250"
T = 0.064"
MLD = 2.5"

Step 3: Determine setback.

$$\boldsymbol{SB = R + T}$$
$$SB = 0.25" + 0.064"$$
$$SB = 0.314"$$

Step 4: Find the flat line dimension (flat) of the end to be formed.

$$\boldsymbol{Flat = MLD - SB}$$
$$Flat = 2.5" - 0.314"$$
$$Flat = 2.186"$$

Step 5: Using the flat line dimension, sketch the bend tangent line on the layout.

Step 6: Calculate the sight line.

$$\boldsymbol{SL = BTL + R}$$
$$SL = 2.186" + 0.25"$$
$$SL = 2.436"$$

Step 7: Locate the sight line by measuring in from the bend tangent line.

After completing the steps above:

4. Which end of the metal should be inserted in the brake? *The end that was identified in step 2.*
5. What is used to align the metal so the bend will be in the correct place? *The sight line.*
6. Where is the sigh line aligned to? *Directly under the end of the radius bar.*

Illustrated Parts Manual Search - Solutions

Locate the following information from the Lycoming O-320-D1A illustrated parts manual.

	Index Number	Part Number	Quantity Required
Screw	4	STD-1882	2
Low pressure fuel pump	2	LW-15472	1
Fuel pump gasket	1	60096	1

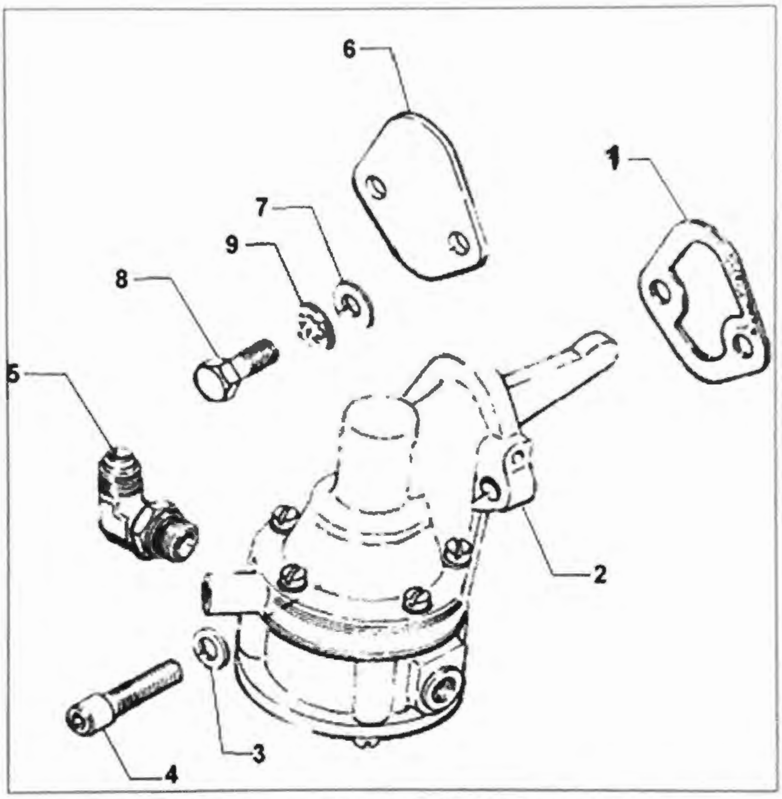


Figure 13. FUEL PUMP ASSEMBLY AND ATTACHING PARTS

FIG. & INDEX	PART NUMBER	DESCRIPTION	QUANTITY PER ASSY.											
			B2B	B2C	B3B	D1A	D1D	D1F	D2A	D2B	D2C	D2G	D2J	D3G
1	60096	GASKET, Fuel pump	1	1	1	1	1	1	1	1	1	1		1
2	LW-15472	FUEL PUMP, Low pressure, dual diaphragm (6441271)	1	1	1	1	1	1	1	1	1	1		1
	LW-16335	FUEL PUMP, Low pressure, dual diaphragm (6441452)					1							
3	STD-33	WASHER, 3/8 plain	2	2	2	2	2	2	2	2	2	2		2
4	STD-1882	SCREW, 3/8-16 x 1-9/32 long, socket hd., dr. hd.	2	2	2	2	2	2	2	2	2	2		2
5	72377	ELBOW, 3/8 tube, 90° (inlet)					1							
6	65098	COVER, fuel pump	1	1										
7	STD-33	WASHER, 3/8 plain	2	2										
8	LW-38.75	BOLT, 3/8-16 x ¾ long, hex. hd.	2	2										
9	STD678	WASHER, lock	2	2										

Type Certificate Data Sheet / Aircraft Specification Review – Solutions

Piper PA-22-150

Aircraft Specification Number: ***1A6***

Datum Location: ***Wing Leading Edge***

Engine (Make and Model): ***Lycoming O-320-A2A or O-320-A2B***

Propeller: (Make and Model): ***Sensenich M74DM***

Are spacers required for this engine prop combination? ***No, See Note 2 on TCDS P-886***

Engine TCDS #: ***E-274***

Carburetor: ***LVC-5-4PA***

Magnetos (list two types): ***S4LN21 / S4LN20***

Spark plugs (List 2 brands and 2 of their part numbers): ***Champion REM38E / Tempest UREM40E***

Mitsubishi MU-2B-26A

TCDS Number: ***A10SW***

Engine (Make and Model List 2): ***Honeywell (AiResearch / Garrett TPE 331-5-252M***

How many approved propellers? ***6***

Fuel (List 2 types): ***Jet A and Jet A-1***

Datum: ***Nose of fuselage***

Textron Beechcraft A60

TCDS Number: ***A12CE***

Rudder control surface movement: ***Right 33° Left 28°***

Leveling means: ***Drop plumb bob line between leveling screws in cabin door frame near rear edge***

Datum: ***Located 100 in. forward of the front pressure bulkhead***

List 2 approved propeller hubs: ***HC-F3YR-2 / HC-F3YR-2F***

Type Certificate Data Sheet / Aircraft Specification Review – Solutions continued

Viking DeHavilland DHC-2 MK 1

TCDS Number: *A-806*

Approved Engine: *Pratt and Whitney Wasp Jr. 985 SB-3*

Location of approved optional engines: *Under 301(a) through 301(i)*

Engine limits at takeoff: *36.5 in.HG / 2300RPM / (450hp) @ Sea Level*

How many approved propellers? *2*

Datum: *100 in ahead of 17.5in. aft of wing leading edge (=82.5 inches forward of wing)*

Pratt & Whitney Wasp Jr. SB-3

TCDS Number: *E-123*

Carburetor (list 2): *Stromberg NA-R9B / Stromberg NA-R9C2*

Fuel type: *Grade 80/87*

Magnetos (list 2): *Scintilla VAG-9D / Bosch SB9R-U2*

Timing: *25°BTC*

Spark plugs (list 4): *AC S-86R, SR-83P, HSR-86, HSR-83P, SR-97, HSR-87*.

Airworthiness Directive Research - Solutions

List the **4 MOST RECENT ADs** issued for the assigned aircraft. Place an "X" in the appropriate column to indicate if the AD applies or does **NOT** apply to the given serial number for the aircraft.

Mitsubishi MU-2B-26A   Serial Number: 349SA

AD Number	Applies	Does NOT apply
2020-26-14	✓	
2010-10-17	✓	
2007-17-09	✓	
2006-17-05	✓	

Beech Duke A 60   Serial Number: P-147

AD Number	Applies	Does NOT apply
2002-10-13	✓	
2001-02-10	✓	
99-05-13	✓	
99-03-11		✓

Baron 58 (Beech Baron)   Serial Number: TH-1008

AD Number	Applies	Does NOT apply
2013-16-01	✓	
2012-10-02		✓
2011-27-04		✓
2009-25-01	✓	

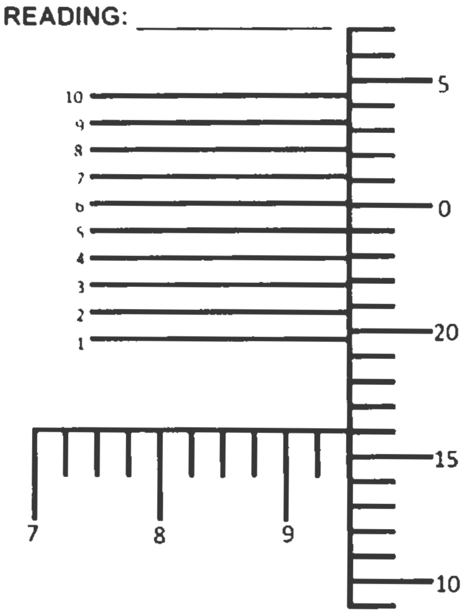
Viking DeHavilland DHC-2 Mk1   Serial Number: 775

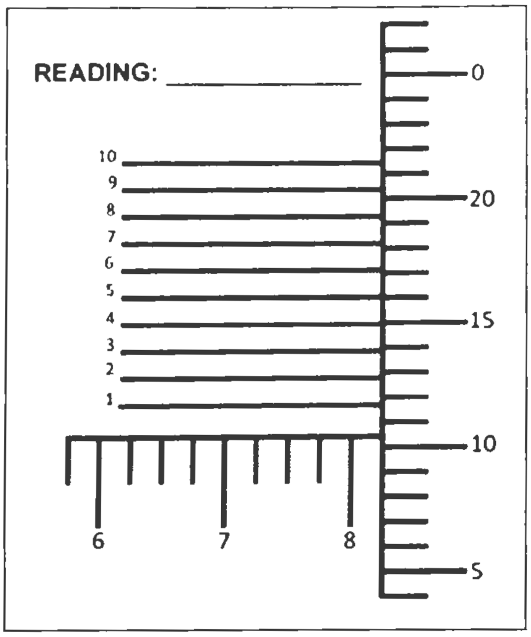
AD Number	Applies	Does NOT apply
2020-16-15		✓
2018-19-11	✓	
2016-25-22	✓	
2015-02-10	✓	

Search for the following ADs by the AD number

AD Number	Acft Make	Subject	When compliance is due
67-24-02	Piper	Fuel Starvation	Next 15 hrs.
80-11-04	Cessna	Cracked Nutplates	Within 100 hrs. every 100 hrs. thereafter
47-50-13	Downer	Propeller inspection	Next 25 hrs. and every 25 hrs. thereafter
50-17-02	Stinson	Rudder cable	Next 25 hrs. every 100 hrs. thereafter

Micrometer reading - Solutions





Reading: 0.9415 ***Reading: 0.8105***

Radio and Antenna Installation- Solution

You have performed the following tasks on YOUR aircraft. Complete the FAA form 337, required logbook entry, and weight and balance for this work.

A King radio (Model KX-170B, S/N 3446 was removed from station +14 and a Bendix radio (Model KX-125, S/N5667) was installed in the same location. Also, a King antenna (Model 355, S/N 7809) was removed from station +76.8 and a Comant Industries antenna (Model CI-121, S/N 2336) was installed at the same location. **ALL WORK** was performed in accordance with STC SA109AC and the Bendix Radio Model KX125 installation manual, P/N KX717A3. **A 100-hour inspection was also performed, and the aircraft was determined to be in airworthy condition.** ***(Note: The Bendix radio installation manual will also include the antenna installation procedures.)***

Aircraft: Cessna 172N

Registration Number: N2345

Serial Number: 123445

Aircraft total time: 9806 hours

Empty Weight: 1765lbs

Empty weight CG: +37

Radio weights	Antenna weights
King 7.5 lbs.	King 4.5 lbs.
Bendix 2.5 lbs.	Comant 1.5 lbs.

ITEM	WEIGHT	ARM	MOMENT
Empty Weight	**+1765**	**+37**	**+65305**
King radio	**-7.5**	**+14**	**-105**
Bendix radio	**+2.5**	**+14**	**+35**
King antenna	**-4.5**	**+76.8**	**-345.6**
Comant antenna	**+1.5**	**+76.8**	**+115.2**
TOTAL	**1757**	**CG = +36.99**	**65004.6**

Date: (Use current date) **(LOGBOOK ENTRY)** **Aircraft Time:9806**

Removed King radio (Model KX-170B, SN3446) from station +14 and installed a Bendix radio (Model KX-125, SN 5667) at the same location. Also removed a King antenna (Model 355, SN7809) from station +76.8 and installed a Comant Industries antenna (Model CI-121, SN 2336) at the same location. All work performed in accordance with STC SA109AC and the Bendix radio installation manual PN KX 717A3. Reference FAA Form 337 dated (use current date Weight and balance computed and entered in the aircraft records. Equipment list revised. Operational checks Performed and found satisfactory. I certify that this aircraft has been inspected in accordance with a 100-hour Inspection as was determined to be in an airworthy condition.

Signature

Pending, AP

US Department
of Transportation
**Federal Aviation
Administration**

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020
Exp. 01/31/2023

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS. Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark N2345	Serial No. 123445
	Make Cessna	Model 172 — Series N
2. Owner	Name (*As shown on registration certificate*) Your Name	Address (*As shown on registration certificate*) Address [illegible] City ______ State ______ Zip ______ Country ______

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Cessna	(*As described in Item 1 above*)	123445
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency	
Name Mechanic's name and address	X U. S. Certificated Mechanic	☐ Manufacturer
Address [illegible]	☐ Foreign Certificated Mechanic	C. Certificate No.
City ______ State ______	☐ Certificated Repair Station	Pending
Zip ______ Country ______	☐ Certificated Maintenance Organization	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY ☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other (*Specify*)

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements

8. Description of Work Accomplished
(If more space is required, attach additional sheets Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark
Date

Removed King radio (Model KX-170B, SN3446) from station +14 and installed a Bendix radio (Model KX-125, SN 5667) at the same location. Also removed a King antenna (Model 355, SN7809) from station +76.8 and installed a Comant Industries antenna (Model CI-121, SN 2336) at the same location. All work performed in accordance with STC SA109AC and the Bendix radio installation manual PN KX 717A3. Weight and balance computed and entered in the aircraft records. Equipment list revised. Operational checks performed and found satisfactory. -------------
--END--

☐ Additional Sheets Are Attached

Grimes beacon installation - Solution

You have performed the following alteration. Complete the FAA form 337, required logbook entry and the weight and balance for the work.

A Grimes rotating beacon P/N RD321, S/N RB224 was removed from the bottom of the fuselage at station +82, and a Grimes strobe beacon, P/N SB123, S/N 987SB was installed at the same location in accordance with STC SA1123SB.

Aircraft: Cessna 182RG

Registration Number: N253RG

Serial Number: 182113R

Aircraft time: 1820 hrs.

Aircraft owner: TN Tech Center
25543 Centennial
Blvd.
John C. Tune Airport

Empty weight: 1800 lbs.

Empty weight CG: +40

Grimes rotating beacon: 5.4 lbs.

Grimes strobe beacon: 3.6 lbs.

ITEM	WEIGHT	ARM	MOMENT
Acft Empty Weight	+1800	+40	+72000
Rotating Beacon	-5.4	+82	-442.8
Strobe Beacon	+3.6	+82	+295.2
TOTAL	1798.2	CG = +39.95	71852.1

Date: (use current date) **(LOGBOOK ENTRY)** **AIRCRAFT TIME: 1820 hrs.**

Removed Grimes rotating beacon PN RB321, SNRB224, from the bottom of the fuselage at station +82 and Installed a Grimes strobe beacon PN SB123, SN897SB in the same location in accordance with STC SA1123SB. Reference FAA form 337 dated (use current date). Weight and balance computed and in the aircraft records. Equipment list revised. Operational check performed and found satisfactory.

Signature

Pending, AP

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp. 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark N253RG	Serial No. 182113R	
	Make Cessna	Model 182	Series RG
2. Owner	Name *(As shown on registration certificate)* TN Technology Center	Address *(As shown on registration certificate)* Address 25543 Centenial Blvd John C. Tune Airport City Nashville State TN Zip 37225 Country United States	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Cessna	*(As described in Item 1 above)*	182113R
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency			
Name Mechanics name and address	X	U. S. Certificated Mechanic		Manufacturer
Address		Foreign Certificated Mechanic	C. Certificate No.	
City State		Certificated Repair Station	Pending	
Zip Country		Certificated Maintenance Organization		

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark ____________ Date ____________

Removed Grimes rotating beacon PN RB321, SNRB224, from the bottom of the fuselage at station +82 and Installed a Grimes strobe beacon PN SB123, SN897SB in the same location in accordance with STC SA1123SB. Reference FAA form 337 dated (use current date). Weight and balance computed and in the aircraft records. Equipment list revised. Operational check performed and found satisfactory. ---END-------------------

☐ Additional Sheets Are Attached

Wheel pants removal - Solution

You have performed the following alteration. Complete the FAA form 337, required logbook entry and weight and balance for this work.

You have **removed** the wheel pants from a Piper PA-22-150, S/N 22150005, N150PA, in accordance with STC SA3345. The aircraft total time is 3855 hrs. The aircraft empty weight is 1670 lbs. with a C.G. of +14.25. The weight of the removed wheel pants are as follows: Nose wheel pants, P/N WP115N (8.5 lbs. at a -24); left and right main wheel pants, P/N WP115M (12.3 lbs. **each** at +17.8).

The aircraft owner is listed as:

Miller, Laurel

123 Main Street

Hendersonville, TN 37222

ITEM	WEIGHT	ARM	MOMENT
Aircraft Empty Weight	*+1670*	*+14.25*	*+23797.5*
Nose Wheel pant	*-8.5*	*-24*	*+204*
Main wheel pants	*-24.6*	*+17.8*	*-437.88*
TOTAL	*+1636.9*	*CG = +14.39*	*+23563.62*

Date: (use current date) **(LOGBOOK ENTRY)** **Total time: 3855**

Removed nose wheel pant PN WP115N from station -24 and both left and right main wheel pants PN WP115M
From station +17.8, in accordance with STC SA3345. Reference FAA form 337 dated (use current date). Weight and
Balance computed and entered in aircraft records. Equipment list revised. Operational check performed and
Found satisfactory.
Signature
Pending AP

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp: 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark N150PA	Serial No. 22150005	
	Make Piper	Model PA-22	Series 150
2. Owner	Name *(As shown on registration certificate)* Miller, Rodney Miller, Laurel	Address *(As shown on registration certificate)* Address 123 Main street City Hendersonville State TN Zip 37222 Country United States	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Piper	*(As described in Item 1 above)*	22150005
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency			
Name Mechanics name and address	x	U. S. Certificated Mechanic		Manufacturer
Address		Foreign Certificated Mechanic	C. Certificate No.	
City State		Certificated Repair Station	Pending	
Zip Country		Certificated Maintenance Organization		

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐	FAA Flt. Standards Inspector	☐	Manufacturer	☐	Maintenance Organization	☐	Persons Approved by Canadian Department of Transport
	☐	FAA Designee	☐	Repair Station	☐	Inspection Authorization		Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

---

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

[illegible]	[illegible]
Nationality and Registration Mark	Date

Removed nose wheel pant PN WP115N from station -24 and both left and right main wheel pants PN WP115M from station +17.8, in accordance with STC SA3345. Reference FAA form 337 dated (use current date). Weight and balance computed and entered in aircraft records. Equipment list revised, Operational check performed and found satisfactory.--
--END--

☐ Additional Sheets Are Attached

Wheel and brake installation - Solution

You have performed the following alteration. Complete the FAA form 337, required logbook entry and weight and balance for this work.

You have removed the existing Cleveland brakes, P/N 22333, S/N 4455, from both main gears at station +110 and installed Parker Wheel and Brake kit#3321 to the same location, in accordance with STC SA648GL, Parker brake assembly installation manual P/N PH9542B, and the Mitsubishi MU-2B-26A Maintenance Manual. You have also performed a 100-hour inspection and determined the aircraft to be airworthy.

Aircraft: Mitsubishi MU-2B-26A
Registration Number: N8910
Serial Number: 1234567
Aircraft total time: 2151 hrs.
Aircraft Owner: Mid-South Aviation
123 Hangar Rd.
Murfreesboro TN 37200

Empty weight: 2500 lbs.
Empty weight CG: +95
Cleveland Brakes: 35 lbs. each
Parker Brakes: 45 lbs. each

Item	Weight	Arm	Moment
Aircraft Empty Weight	*+2500*	*+95*	*+237500*
Cleveland Brakes	*-70*	*+110*	*-7700*
Parker Brakes	*+90*	*+110*	*+9900*
Total	*+2520*	*CG = +95.11*	*+239700*

Date: (Current date) Total time: 2151hrs.
Removed Cleveland brakes, PN2233, SN4455, from both main gear at station +110 and installed Parker wheel and Brake kit #3321 to the same location in accordance with STC SA648GL Parker brake assembly installation manual PN PH9542B, and Mitsubishi MU-2B-26A maintenance manual. Reference FAA form 337 dated (use current date) Weight and balance computed and entered in the aircraft records. Equipment list revised. Operational checks Performed and found satisfactory. I certify that this aircraft has been inspected in accordance with a 100-hour Inspection and was determined to be in airworthy condition.

Your signature
Pending, AP

US Department
of Transportation
**Federal Aviation
Administration**

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp. 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark N8910	Serial No. 1234567	
	Make Mitsubishi	Model MU-2B	Series 26A
2. Owner	Name *(As shown on registration certificate)* Mid-South Aviation	Address *(As shown on registration certificate)* Address 123 Hangar Street City Murfreesboro State TN Zip 37200 Country United States	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Mitsubishi	*(As described in Item 1 above)*	1234567
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name Mechanics name and address
Address
City State
Zip Country

B. Kind of Agency

X	U. S. Certificated Mechanic		Manufacturer
	Foreign Certificated Mechanic	C. Certificate No.	
	Certificated Repair Station	Pending	
	Certificated Maintenance Organization		

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

[illegible]	[illegible]
Nationality and Registration Mark	Date

Removed Cleveland brakes, PN2233, SN4455, from both main gear at station +110 and installed Parker wheel and brake kit #3321 to the same location in accordance with STC SA648GL Parker brake assembly installation manual PN PH9542B, and Mitsubishi MU-2B-26A maintenance manual. Weight and balance computed and entered in the aircraft records. Equipment list revised. Operational checks performed and found satisfactory.---
--END--

☐ Additional Sheets Are Attached

Gasculator installation - Solution

You have performed the following alteration. Complete the FAA form 337, required logbook entry and the weight and balance for this work.

You have removed the existing fuel Gasculator (strainer/separator), P/N 9988, S/N 7766, from the front face of the firewall (station -18) and installed a new "Steve's" Gasculator, P/N 02235S, SN 11236S, in the same location, in accordance with STC SA01026SE. There will be no change in the weight and balance data.

Aircraft: Piper PA-22-150

Registration number: N150PA

Serial Number: 22150005

Aircraft total time: 2448 hrs.

Aircraft owner: Miller, Rodney
Miller, Laurel
123 Mian street
Hendersonville, TN 37222

Date: (Use current date)	**Total time: 2448 hrs.**

Removed existing fuel Gasculator, PN9988, SN7766, from the front face of the firewall at station -18 and installed
A new "Steves" Gasculator PN 02235S, SN 11236S, in the same location, in accordance with STC SA01026SE.
Reference FAA form 337 dated (use current date). No changes in weight and balance. Equipment list revised.
Operational checks performed and found satisfactory.

Your signature
Pending, AP

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020 Exp. 01/31/2023	Electronic Tracking Number
For FAA Use Only	

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark N150PA	Serial No. 22150005	
	Make Piper	Model PA-22	Series 150
2. Owner	Name *(As shown on registration certificate)* Miller, Rodney Miller, Laurel	Address *(As shown on registration certificate)* Address [illegible] Main Street City Hendersonville State [illegible] Zip 37222 Country United States	

3. For FAA Use Only

4. Type		**5. Unit Identification**			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Piper	*(As described in Item 1 above)*	22150005
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency		
Name Mechanic's name and address	x	U. S. Certificated Mechanic	☐ Manufacturer
Address		Foreign Certificated Mechanic	C. Certificate No.
City State		Certificated Repair Station	Pending
Zip Country		Certificated Maintenance Organization	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐	Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY	☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization	☐ Persons Approved by Canadian Department of Transport
	☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization	Other *(Specify)*

Certificate or Designation No.	Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

N1SEFA
Nationality and Registration Mark

Use Current Date
Date

Removed existing fuel Gasculator, PN9988, SN7766, from the front face of the firewall at station -18 and installed a new " Steves " Gasculator PN 02235S, SN 11236S, in the same location, in accordance with STC SA01026SE. No changes in weight and balance. Equipment list revised. Operational checks performed and found satisfactory. ------------------------------

------------------------------END------------------------------

☐ Additional Sheets Are Attached

Carburetor air filter - Solution

You have performed the following alteration. Complete the FAA form 337 and required logbook entry.

You have removed the existing carburetor air filter, P/N 9987, S/N 1123, from the carburetor heat box at station -14 and installed a Brackett Air Filter Assembly # BA4208 in the same location, in accordance with STC SA71GL, Brackett Filter Assembly Installation Manual PN BFGAB3, drawing# BF1448C, revision 15, dated August 13, 1986. There are no changes to the weight and balance.

Aircraft: Cessna 150A

Registration Number: N891CA

Serial Number: 150A567

Aircraft total time: 4339 hrs.

Aircraft owner: Tullahoma Aviation
2668 Taxi Way Lane
Tullahoma, TN 37355

Date: (use current date) **Total Time:4339 hrs.**

Removed existing carburetor air filter, PN 9987, SN 1123, from the carburetor heat box at station -14 and installed
A Brackett Air Filter assembly BA4208 in the same location, in accordance with STC SA71GL Brackett Air Filter
Installation manual, PN BFGAB3 drawing #BF1448C revision 15, dated August 13, 1988. Reference FAA form 337
Dated (current Date). No changes in weight and balance. Equipment list revised. Operational checks performed and
found satisfactory.

Your signature
Pending, AP

US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

OMB No. 2120-0020
Exp. 01/31/2023

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft

Nationality and Registration Mark: N891CA
Serial No.: 150A567
Make: Cessna
Model: 150
Series: A

2. Owner

Name *(As shown on registration certificate)*: Tullahoma Aviation

Address *(As shown on registration certificate)*
Address: 2668 Taxi Way lane
City: [illegible] State: [illegible]
Zip: [illegible] Country: [illegible]

3. For FAA Use Only

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
☐	☒	AIRFRAME	Cessna	*(As described in Item 1 above)*	150A567
☐	☐	POWERPLANT			
☐	☐	PROPELLER			
☐	☐	APPLIANCE	Type Manufacturer		

6. Conformity Statement

A. Agency's Name and Address
Name: Mechanic's name and address
Address:
City: State:
Zip: Country:

B. Kind of Agency

☒	U. S. Certificated Mechanic
☐	Foreign Certificated Mechanic
☐	Certificated Repair Station
☐	Certificated Maintenance Organization
☐	Manufacturer

C. Certificate No.: Pending

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B ☐

Signature/Date of Authorized Individual

7. Approval for Return to Service

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☐ Approved ☐ Rejected

BY

☐ FAA Flt. Standards Inspector	☐ Manufacturer	☐ Maintenance Organization
☐ FAA Designee	☐ Repair Station	☐ Inspection Authorization

☐ Persons Approved by Canadian Department of Transport

Other *(Specify)*

Certificate or Designation No.

Signature/Date of Authorized Individual

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements

8. Description of Work Accomplished
(If more space is required attach additional sheets Identify with aircraft nationality and registration mark and date work completed)

Nationality and Registration Mark ____________ Date ____________

Removed existing carburetor air filter, PN 9987, SN 1123, from the carburetor heat box at station -14 and installed a Brackett Air Filter assembly BA4208 in the same location, in accordance with STC SA71GL Brackett Air Filter installation manual, PN BFGAB3 drawing #BF1448C revision 15, dated August 13, 1988. No changes in weight and balance. Equipment list revised. Operational checks performed and found satisfactory.--
--END--

☐ Additional Sheets Are Attached

Appendix 4 – FAA Publications and Reference Guide

APPENDIX 4 – FAA PUBLICATION AND REFERENCE GUIDE		
FAA Publication and Reference Guide		

FAA Publications and Reference Guide

The below list of publications are the main reference materials used by the FAA to write the A&P written and oral and practical examinations. Most of these publications can be viewed pr downloaded from the FAA website. www.FAA.gov Our aviation store also carries the AC 43.13-1B, FAA-H-8083-30A, FAA-H-8083-31, FAA-H-8083-32, in paper form.

The publications most often used for general study are:

Federal Aviation Regulations

(Title 14 of the Code of Federal Regulations)

Part – 1: Definitions and Abbreviations.

21: Certification Procedures for Products and Parts.

23: Airworthiness Standards: Normal Category Airplanes.

25: Airworthiness Standards: Transport Category Airplanes.

27: Airworthiness Standards: Normal Category Rotorcraft.

29: Airworthiness Standards: Transport Category Rotorcraft.

33: Airworthiness Standards: Aircraft Engines.

35: Airworthiness Standards: Propellers.

37: Technical Standard Order Authorizations.

39: Airworthiness Directives.

43: Maintenance, Preventative Maintenance, Rebuilding and Alteration.

45: Identification and Registration Markings.

65: Certification: Airmen Other Than Flight Crewmembers.

91: General Operating and Flight Rules.

121: Operating Requirements: Domestic, Flag, and Supplemental Organizations.

Advisory Circulars

AC 00-2: Advisory Circular Checklist: (Provides a list of current FAA Advisory Circulars.)

AC 39.7: Airworthiness Directives: (Provides guidance and information to owners and operators of aircraft concerning their responsibility for complying with Airworthiness Directives and recording AD compliance in the appropriate maintenance records.

AC 49.9: Maintenance Records: (Discusses maintenance record requirements under FAR parts 49.9, 43.11, and 91.411.)

AC 43.9-1: Instructions for completion of FAA form 337, Major Repairs and Alterations. Provides instructions for completing the 377 for major repairs and major alterations on airframes, powerplants, propellers, and appliances.)

AC 43.13-1B: Acceptable methods, Techniques, and Practices – Aircraft Inspection and Repair. (Contains methods, techniques, and practices acceptable to the Administrator for inspection and repair to civil aircraft.)

AC 43.13-2B: Acceptable methods, Techniques, and Practices – Aircraft Alterations. (Contains methods, techniques, and practices acceptable to the Administrator in altering civil aircraft.)

FAA-H-8083-30A: Airframe and Powerplant Mechanic's – General Handbook. This handbook may be used for training mechanics, or for on-the-job training in basic information on electricity, weight and balance, physics, mathematics, mechanic privileges and limitations, etc.)

FAA-H-8083-31: Airframe and Powerplant Mechanic's – Airframe Handbook. This handbook may be used for training mechanics, or for on-the-job training in airframe construction, repair, and the operating theory of airframe system.)

FAA-H-8083-30A: Airframe and Powerplant Mechanic's – Powerplant Handbook. This handbook may be used for training mechanics, or for on-the-job training in aircraft engines, fuel and metering systems, exhaust systems, ignition systems, etc.)

MISCELLANEOUS FAA PUBLICATIONS

Information contained in the following publications are needed by a certificated mechanic during the exercise of certain privileges. Mechanic applications